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PC MAGAZINE

Page 134

Page 147

Inside the INTEL 80386 Microprocessor

WHAT'S INSIDE

William G. Wong and Bill Howard

When Compaq rolls out a new computer, the curiosity among the media and business community is twofold: How is Compaq going to top the previous machine, and how is it going to top its last product-intro bash?

While the original Compaq Portable and Portable Plus were introduced with little fanfare in November 1982 and October 1983, respectively, the Deskpro rolled out in June 1984 to a powerful sound-and-light show and the driving music of *Flashdance—What a Feeling!* Then the Pointer Sisters danced atop a bigger-than-life PC and sang *I'm So Excited* at the November unveiling of the Deskpro 286 and Portable 286 in April 1985. Ten months later, for the Portable II at Jones Hall in Houston, Compaq brought out the Houston Symphony Orchestra led by London Royal Philharmonic conductor Louis (*Hooked on Classics*) Clark, *plus* Irene Cara for a live rendition of *What a Feeling!*

For the Deskpro 386, corporate communications director Ken Price rented New York's chi-chi Palladium nightspot and executed yet another razzle-dazzle laser light show integrated with a megadecibel, zero-distortion tape of Neil Diamond's *Into the Future*. Compaq says the Palladium was chosen because it's like the Deskpro 386. Both offer nondescript exteriors—the Palladium is an aging theater while the Deskpro 386 looks the same as the Deskpro 286—set off by ultrasophisticated interiors. Fortunately, Compaq's new machine is better by far than the company's analogies.

To prepare this issue's cover story on the potential of the Deskpro 386, executive editor Bill Howard and PC Labs director Bill Wong (pictured above) flew to Houston weeks before the rollout for an advance look at the first of the 386-based machines to come from a major player. As the story (page 134) and benchmark test results indicate, the Deskpro 386 is twice as fast as a run-of-the-mill PC AT, and with new software it could be ten times as fast.

Also in the cover package: a look at the potential of Intel's 80386 processor and the potential for some company other than IBM to lead the way into the next generation of PCs. The outlook for both: excellent, according to technical guru Charles Petzold and industry analyst Jim Seymour.

Also in our final 1986 issue, three regular writers tackle the difficult topic of RAM-resident software. Robin Raskin recounts the history, while Stephen Randy Davis reviews RAM-resident program managers. Charles Petzold explains the technicalities and proposes the ultimate solution—one that we hope to see more of in 1987. "Taking Up Residence" begins on page 163.

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LETTERS TO PC MAGAZINE

READERS' CONFESSIONS

Stewart Alsop's confession in his column "I Bought Mail Order!" (*PC Magazine*, Volume 5 Number 15) struck a responsive chord. I am not a power user, but I'm a moderately sophisticated shopper. And I am fed up with retail computer stores.

I would love to be able to pay for information. I want information. In fact, I go to the retail stores for information and demonstrations, and I am quite willing to pay the full retail price, rather than the mail-order discount, to get that help. Unfortunately, I seldom get it. And so, my favorite line remains: "I'm a salesman. You'll have to contact the technical people about that." And no, he doesn't know their number.

Hampden H. Smith III
Lexington, Virginia

Stewart Alsop really hit the nail on the head in his column "I Bought Mail Order!" For those of us who use our computers more as a hobby than for business, it is very hard to see the logic in spending more than we have to for hardware and software. Although my local dealer has given me helpful support, I have learned more from my peers in my local user group. It is an insult to your intelligence for anyone to think you must pay extra for help that is not truly effective.

Pete Martinez
Tyler, Texas

We receive many letters from readers expressing dissatisfaction with the service they get from both mail-order and retail outlets. For this reason, we publish up-to-date reviews on the latest software and hardware products with the intention that our readers will turn to PC Magazine for the information they need.—Ed.

SOME QUESTIONS ANSWERED

Superb! That is the only adjective that even comes close to describing your magazine. There is no other publication on the market that can match your insight or thoroughness of testing. You are the standard of computing in print. Your combination of talent and commitment to the industry makes you shine—each issue is a gem.

I would appreciate it if you could answer some questions I have about your magazine. For one, how can I obtain back issues? Also, how can I participate in outside testing and evaluation of products? Does *PC Magazine* allow or consider this type of contribution?

Mark A. Fairchild
Midland, Texas

You can order back issues of PC Magazine by sending a $6 check or money order for each requested issue ($7 outside the United States) to Kim Armstrong, PC Magazine, One Park Avenue, New York, NY 10016. We're sorry we're not able to furnish back issues dated before January 1985.

*In response to your questions on outside product testing, we use the extensive resources of our PC Magazine Labs for all product testing and evaluations. Occasionally we hire free-lancers to test products, but these are people who have estab-*lished themselves in the industry or who have previously written for our magazine or other computer publications.—Ed.

SIX MINUTES SAVED

Many of the articles in computer magazines go right over my head, so when I read about the /FCCE command in Spreadsheet Clinic (*PC Magazine*, Volume 5 Number 15), I was doubtful.

I have several large spreadsheets running under *1-2-3*, Release 2.0, on a Compaq Deskpro 286; the largest takes 7 minutes and 22 seconds to load. However, using the /FCCE command, it takes only 1 minute and 22 seconds. I am amazed at the faster time and am thankful that my doubts did not prevent me from using your command.

Al Anderson
Warden, Washington

A DIFFERENT DOS

I greatly appreciated Charles Petzold's two Programming/Utilities columns ("Exploring the EGA, Parts 1 and 2," *PC Magazine*, Volume 5 Numbers 14 and 15). However, in Part 2, the programs in Figures 3 through 7 did not work properly for me. Although the fonts were shown correctly on the screen and the correct screen attributes and addresses, scrolling always took place after 25 lines, even with the DOS command DIR. Paradise Systems informed me that this was a function of DOS and not of my Paradise AutoSwitch card, which has run all my other CGA and EGA software beautifully. Did the author use a DOS other than 2.11, or did I miss something?

Jim Bartholomew
Logan, Ohio

■ LETTERS

Charles Petzold replies:

Your reference to DOS 2.11 at the end of your letter indicates that you are using a so-called compatible. Your DOS may indeed behave differently.

When ANSI.SYS is not loaded, all versions of PC-DOS pass teletype screen output to the BIOS. The BIOS, (the EGA BIOS, in this case) determines when to scroll the display. However, when ANSI.SYS is loaded, it, and not the BIOS, determines when to scroll the display (current versions of ANSI.SYS are locked into using 25 lines).

Some versions of DOS for compatibles incorporate ANSI.SYS into DOS instead of making it a user option. If you don't have a DEVICE=ANSI.SYS line in your CON-FIG.SYS file, and you have nothing else loaded that takes over the teletype screen output, this is probably the case with your DOS version.

THANKS A MILLION

Following my purchase of a Tandy T1000 personal computer, I began reading *PC Magazine* to research the MS/PC-DOS machines. By reading your Power User, Programming/Utilities, User-to-User, and Tutor columns, I started to learn about the differences in the IBM and T1000 PC BIOS programming. I also discovered that my version of DOS (2.11.22) was not always compatible with other versions. Fortunately, your writers and contributors published many really helpful tricks and utilities that would allow me to adapt most of these programs to my T1000—thanks a million!

Needless to say, I am now converting many programs to my Tandy T1000. I am especially pleased with the NPAD.COM program you published about 2 years ago (Programming, *PC Magazine*, Volume 3 Number 25). Thank you again for the very informative and thought-provoking articles in each issue.

Brent D. Hoefling
Fort Irwin, California

RECOVERED BY RESET

For some time I have wanted a reset switch on my PC. I saw one at a computer store for $30, but at the time I had already spent enough money on other PC accessories. Then my September issue of *PC Magazine*

arrived and inside was a column about a "little red reset switch" (User-to-User, *PC Magazine*, Volume 5 Number 15). Although I modified the installation procedure to avoid wielding a soldering iron inside my PC, I had the switch up and running in 10 minutes. By my most conservative estimate, I recovered the cost of my year's subscription to *PC Magazine* by reading the first issue I received.

Greg Krumrey
St. Louis, Missouri

ELGAR RESPONDS

I read the article "Backup Power: When the Juice Stops Flowing" (*PC Magazine*, Volume 5 Number 15) and was disappointed to find that Elgar Corp.'s SPS-550 and SPS-1000 were not included in your analysis. The SPS-550 would be our recommended product for an IBM XT, AT, or compatible.

The SPS-550 is also usually sold with our own software (Elgar's *Failsafe* software). This software shuts down the computer and can also park the hard disk in an orderly fashion after a predetermined amount of time. This is significant since in any battery backup system, the batteries can run down to a point at which they may not provide adequate backup time. When that backup time is exhausted, the system crashes.

Elgar's SPS-550 with *Failsafe* is the only system on the market that guarantees the PC will shut down in an orderly fashion (even if the PC is unattended) and will not crash after a short period of time. Furthermore, *Failsafe* reboots the system after power is restored, brings the system up to where it left off, and continues the operations.

I am also very concerned that even though our SPR-350 unit was reviewed, it was not described adequately. For example, the unit is also equipped with our *Failsafe* package, although it was not evaluated. I believe this was a major omission.

Also, it is common knowledge in the AC-to-DC power conversion field that the rectification technique used in most PCs is essentially related to the peak value of the applied AC input voltage. Also, most AC voltmeters are calibrated to read the root mean squared (RMS) value of the wave-form as would appear to be the case with

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■ LETTERS

your instrumentation.

The 120-VAC utility line provides a peak voltage of approximately 170 volts to the computer. The Elgar SPR-350 provides a peak voltage and an RMS voltage, both of which are approximately 150 volts. This results in a slight undervoltage (not overvoltage) applied to the PC, which is partially compensated for by a higher rectification efficiency with square wave drive than with sine wave drive. These factors help to account for the long 50-minute battery operation when the XT operated from an SPR-350. Actually, operation from an SPR-350 should be reassuring, since the circuit is reliable, well designed, and fully interfaced with the PC.

In conclusion, the measured voltage (RMS and peak) of 153V should be expected for any square wave unit, and it is significantly less than the peak of a normal sine wave unit. Please also note that the SPR-350 is UL recognized.

As you may be aware, Elgar has been the leading worldwide supplier of AC power sources and has been in the power-protection business for more than 20 years. Quality and accuracy are essential for a company to grow and succeed in this field, as we have.

Doug Caldwell
Elgar Corp.
San Diego, California

Winn L. Rosch replies:
Despite Mr. Caldwell's assurance that the SPR-350 is "fully interfaced" with the PC, IBM states the voltage limits of the PC to be a minimum of 104 and a maximum of 127 VAC (RMS). Because the 153-VAC output of the SPR-350 is clearly outside the manufacturer's published specifications, we cannot recommend the device for use with the PC.

Although the switching supplies used in most computers may be able to deal with the high RMS voltage present at the output of the Elgar SPR-350, such high voltages can cause heating problems and may shorten the life of equipment with linear power supplies (such as many computer peripherals) and resistance devices (such as light bulbs). PC Labs monitored both peak and RMS voltage values and confirmed those measurements with an oscilloscope.

■ LETTERS

The SPS-550 (which I am currently reviewing) is clearly a superior unit. I have also been able to test the Failsafe software with the SPS-550. Although a bit quirky (it has a tendency to crash my system when used with other memory-resident software), it may prove useful to those who leave their PCs operating unattended for substantial periods.

[We stated in the review of the SPR-350 that the unit is not UL listed. That statement is correct: according to the Santa Clara office of Underwriters Laboratories (UL), prior to August 1986 a product with square wave output would not have been UL listed. The criteria for UL recognition are different and indeed the Elgar SPR-350, which produces square waves, was UL recognized.

The review of the SPS-550 to which Winn L. Rosch refers will appear in an upcoming issue of PC Magazine.—Ed.]

CORRECTIONS

An incorrect address and phone number appeared in the Fact File for the Microtek Labs MS 300A scanner ("Page-to-Disk Technology: Nine State-of-the-Art Scanners," *PC Magazine*, Volume 5 Number 16, page 148). Microtek Labs Inc. is located at 16910 S. Western Ave., Gardena, CA 90247; (213) 321-2121.

The first line in the patch for installing MicroPro's International Corp.'s CorrectStar on WordStar, Version 3.3, (Power User, *PC Magazine*, Volume 5 Number 8, page 268) should read E1342.

HOW TO WRITE TO PC MAGAZINE

Do you have a comment, compliment, or criticism about something you've read in *PC Magazine*? A question you'd like to open up to other readers? Then send your opinion on paper or disk to Letters to PC Magazine, One Park Avenue, New York, NY 10016, or send your opinion through MCI Mail to PCMAGAZINE at address 157-9301. We're sorry we're not able to answer letters personally.

All letters become the property of *PC Magazine* and are subject to editing. We cannot publish letters that do not include a name, address, and phone number for verification.

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CIRCLE 349 ON READER SERVICE CARD

■ **GUS VENDITTO**

PC ADVISOR

Help for readers in increasing hard disk storage capacity by using a new controller and in solving mysterious file losses on floppy disks.

SQUEEZING MORE ON A HARD DISK
Some time ago, I read about a hard disk controller that can increase storage capacity by 50 percent. Is this a well-built card? Will it work in my AT&T PC 6300 with a 20-megabyte hard disk and in my Leading Edge Model M PC with dual floppies? Are there any peculiarities about the card that I should know about before buying?
Stephen M. Robinson
Saratoga, California

We can heartily recommend the Adaptec ACB-2070A Hard Disk Controller (Adaptec Inc., Milpitas, Calif.; (408) 946-8600; $154)—if you are in a position to take advantage of its disk-stretching technology. Only hard disks that can support RLL (Run Length Limited) data encoding are compatible. The following are among the hard disks that can: the Seagate ST238; the Micro Science HH738 and HH1050; the Toshiba MK56FA; the Vertex V150, V170, and V185; the Miniscribe 3425; the Tandon TM 502 and TM 755; the Mitsubishi MR522; the NEC 3126 and 5126; and the Okidata OD526 and OD540.

Any of these disks will give you half again the rated storage capacity in a PC or compatible. The hard disk in your AT&T PC may not be compatible; you'll need to inspect it carefully to determine the manufacturer and serial number. If it's not on the list above, Adaptec will be able to tell you whether or not the disk is compatible.

One small nuisance is that anyone who owns a hard disk rated at 64 megabytes and beyond under normal circumstances will require a software driver (sold by
Chase Technologies, Englewood Cliffs, N.J.; (201) 894-5544) to split the 100-plus megabytes that the Adaptec controller will create into separate logical drives.

SLOPPY DISK ACCESSES
I own an ITT XTRA PC and lately have been receiving curious messages from my B: drive. CHKDSK/V will indicate a perfect disk and DIR will verify the existence of files, yet on accessing these files DOS will assert "Can't find sector" or "Read error." Someone has suggested a disk incompatibility. I was using DSDD disks from Brown and changed to Nashua. I don't seem to have the problem anymore but would like to know about incompatibilities among disk brands.
Barbara McMillen
Perrysburg, Ohio

Are DSDD (double-sided, double-density) disks all alike? For all intents and pur-
poses, name-brand disks are: Nashua, Brown, Maxell, 3M, Polaroid, and a few others stand behind their products and should cause no concern. Avoid disks from fly-by-night operations that sell floppies for two bits or less apiece.*

The tests we've done show disk abuse to be the greatest cause for concern. Disks wear out after hundreds of accesses, so it's a good idea to dispose of them when they start to show physical signs of wear—that's roughly about when the magnetic media will be reaching retirement age.

Disk drives will also suffer from exhaustion after a certain point. They can fall out of alignment and become unable to locate tracks with the pinpoint accuracy that is so critical.

Since your problem seems to be infrequent, I'll wager that your problem stems from too tight a fit inside the disk. Friction from the disk casing is interfering with the disk's rotations. If data seems to be eluding DOS, take the disk out of the drive and shake it around a little. If that doesn't make your files materialize, very carefully stick your finger inside the disk's round center hole and knock the sides until the disk loosens up inside the casing. Don't touch the part of the disk exposed in the sausage hole (the one below the round center hole)—you will almost certainly lose data.

> ■ Disk drives can fall
> out of alignment and
> become unable to locate
> tracks with the pinpoint
> accuracy that is so
> critical.

ASK THE ADVISOR

Send questions about the hardware and software choices you are facing to PC Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016.

PC MAGAZINE FIRST LOOKS

PFS:Professional Write, Great for Personal Use

BY PAUL M. STAFFORD

Don't let the name fool you: *PFS:Professional Write* from Software Publishing Corp. is actually one of the best personal word processors around. Or perhaps it's a good, but somewhat flawed, professional word processor.

Despite its identity crisis, or perhaps because of it, *PFS:Professional Write* is an example of the whole being much greater than the sum of its parts. Some of *PFS:Profes-*

sional Write's major features—macros, an address book, synonyms, network support, file-encryption, line and box drawing, some print formatting options, and more—are not found in Software Publishing's *PFS:Write*. But added features are not the real reason that *PFS:Professional Write* is such a vast improvement over its little brother.

More than any other category of software, word processors depend on their user interfaces for success, and *PFS:Professional Write*'s is a dazzler.

Across the top of the screen

are prompts for the first six function keys. Hitting the appropriate function key brings down a menu, from which you can select items either by typing in the selection number or by highlighting and hitting Return. One nice touch is that you can jump directly from menu to menu, and so you don't have to exit from one to get to another.

Next to many of the selections are Ctrl-key combinations that let you select features directly. (The combinations are usually mnemonic, but for reasons unknown you begin marking a block with Ctrl-T and you

center a line using Ctrl-X).

A status line and a ruler at the bottom of the screen tell you what page, line, and column the cursor is on, if you are in insert mode, and if you're double-spacing the text.

Just as important is that everything in *PFS:Professional Write* happens just when you want it to: immediately. Menus appear instantaneously, on-screen operations happen right away, and both the dictionary and the thesaurus are integrated and speedy.

Nonetheless, a few stupid-

Compaq 386 PC Still Out in Front

BY CHRISTOPHER BARR and GUS VENDITTO

Intel Corp.'s 80386 microprocessor is still the hot topic of discussion in the PC community. When will IBM produce a 386 PC? Who else will follow Compaq's lead? When will DOS support the 32-bit microprocessor?

IBM's not talking. And Epson America, Hewlett-Packard Co., NCR Corp., Data General Corp., Wang Laboratories, and AT&T all refused to comment on their plans for the 386.

Manufacturers prefer to wait until a DOS-compatible operating system that can run in pro-

tected mode and can address the vast linear memory that the 386 can work with is available. DOS 5.0, which should offer both, is not likely to be delivered until the spring of 1987. Quarterdeck Information Systems has announced *DESQview* 1.3, which fully supports the 386's virtual mode under DOS (a Hands-On review will appear in the next issue).

Microsoft Corp. promises to deliver a 386 Xenix soon; Microport of Scotts Valley, Calif., lays claim to having the first 386 Xenix on the market.

Victor Technologies confirmed that it is considering marketing a 386 PC. Samsung

Electronics America and Gulfstream Micro Systems revealed plans for models in 1987.

Tandy/Radio Shack was frank in its denial of any 386 PC development. A spokesperson explained that the company was unwilling to release a 386-based PC before IBM Corp. made a move into the market. It expects IBM, not Compaq Computer Corp., to set the standard.

Corvus Systems of San Jose, Calif., claims that its 386 computers, on sale in late August, were the first to hit the street, several days before Compaq's September 9 introduction. Corvus's Series 386 Workstation, a pricey $12,795 PC AT compatible with 2.5 megabytes of RAM, a 16-MHz clock speed, a 1.2-megabyte floppy disk drive, and a 70-megabyte hard disk. While it is DOS compatible, it is not sold with an operat-

Professional Write

(continued from preceding page)

ities flaw *PFS:Professional Write*'s overall elegance. For example, no on-screen status display tells you when the Caps-Lock and NumLock keys are activated. Some block deletions require you to go to the end of the last line before the deleted block and hit the Del key before the paragraph will reformat itself properly.

Professional Write has no type-ahead buffer for Ctrl-key commands or, most annoyingly, for the Backspace key. You can't backspace quickly or delete six words at a time by pressing Ctrl-W six quick times; you have to wait a few microseconds while the screen updates each deletion.

PFS:Professional Write uses the cut-and-paste method of

moving blocks of text. Strangely, words and lines deleted using the quick-delete method are gone forever; they can't be past-

ed elsewhere or restored, as can blocks deleted using the standard block operation.

Stranger still, *PFS:Professional Write* won't allow you to append text to the end of a line that extends all the way to the right margin. If you try to type a character at the very end of the line, it inserts it before the last character on the line; so you have to retype the last character to get the line to break correctly.

Missing features also spoil *PFS:Professional Write* for professional use. Among other omissions is a way for the program to automatically indent

paragraphs or to mark words, sentences, and paragraphs for block operations.

But the features that are included work unusually well, including some surprising bells and whistles.

A built-in address book lets you search for names and addresses and import them into your document in standard business-letter format.

At a price of somewhere on the low side of the mid-range for its category, *PFS:Professional Write* should find a comfortable—and for Software Publishing, profitable—niche.

What's All This Talk about PFS Power?

From its first days in 1980, Software Publishing Corp. came to symbolize easy-to-use software for novice users. No company spent more time defending the right of new users to be able to get software programs up and working on a computer quickly and painlessly.

That approach worked wonderfully: Software Publishing's revenues grew at an astronomical rate; the company sold more than a million copies of its software; its product line grew to include six basic applications (filing, reporting, writing, graphics, communications, and financial analysis); and the company made a successful public offering of its shares in early 1985.

But something happened on the way to the bank. Late in 1985, the Mountain View, Calif.–based corporation began to report declines in its revenues; its products began to slide off the best-seller lists; and in its last quarter, the company actually reported its first loss.

Analysts began to write the company off as another Silicon Valley flash in the

pan whose day had passed. Behind the scenes, though, Software Publishing took a good look at itself and decided it needed updating.

The result has been seen over the past few months, as the company introduced (and shipped) more new products in a shorter time than any other software company in recent memory.

Software Publishing has transformed itself from the company for novices to the company for people who want to get work done. *First Choice* is its only new offering for novice users and appears to be a true hit, having sold 10,000 copies in its first 2 months.

And, finally, the company has built a new product line under the Harvard label, which includes three products—*Harvard Presentation Graphics* (see First Looks, page 38, *PC Magazine*, Volume 5 Number 13), *Harvard Professional Publisher* (due to ship in November), and *Harvard Total Project Manager* (expected in early 1987)—all specialized products for knowledgeable users. —*Stewart Alsop*

Compaq 386

(continued from preceding page)

ing system.

Advanced Logic Research, an AT-compatible maker, entered the ring in October, also with three models: the Access 386B, at $3,990, with 512K bytes of RAM, a 1.2-megabyte floppy disk drive, and a 16-MHz clock speed; the 386EM, configured similarly but with an additional 512K RAM and a 30-megabyte hard disk; and, at the top of the line, the 386EC, with a total of 2.5 megabytes of RAM.

Austin, Tex.–based PC's Limited expects to have a 386-based PC on sale in the first quarter of 1987 (about the same time as the company's first public stock offering). Michael Dell, PC's Limited's innovative

21-year-old owner, would provide no details other than the broadest hints. "We have made a significant breakthrough concerning the use of the 80386 processor," says Dell.

Don Harper of Computer Dynamics, also in Austin, announced plans to release two 386 models. The first is called the Platinum Plus, a 16-MHz machine with 1 megabyte of RAM and a 1.2-megabyte floppy disk drive, operating under DOS 3.2. Early in 1987, he plans to have a model running at a 24-MHz clock speed.

Another mail-order firm, PC Designs in Tulsa, Okla., plans to have the ET-386i ready for sale by November 1. For about $3,000, the ET-386i will have 1 megabyte of RAM, a 1.2-megabyte floppy disk drive, and a 16-MHz clock speed.

A Quick, Easy Desktop Solution For Small Publishing Jobs

PC HANDS ON

BY DIANE BURNS
AND S. VENIT

It's no surprise that *ClickArt Personal Publisher* closely mimics the look and feel of the Apple Macintosh, the machine on which so-called desktop publishing began. A number of high-end page-composition programs now in development also echo the Mac's use of icon-laden borders to keep graphics options always within reach.

In *ClickArt Personal Publisher*, pop-down menus, scroll bars, and a mouse work together to produce graphically illustrated pages of multicolumn text. A variety of dot matrix printers are supported; HP LaserJet or Apple LaserWriter printer support are optional.

The program allows you to import graphics and ASCII text from external sources via a built-in clipboard. The package was originally sold by T/MAKER, a developer of "click art" graphics libraries for the Macintosh. Software Publishing recently acquired the program and now markets it as a low-cost solution for producing leaflets, announcements, and simple newsletters.

ClickArt Personal Publisher

gives PC users access to the same click art libraries originally developed for *MacPaint* on the Macintosh. The package comes with one of the T/MAKER libraries on a PC disk; additional libraries cost $49 each. Three include: *ClickArt Personal Graphics*, *ClickArt Publications*, and *Holidays*.

A single *ClickArt Personal*

Publisher document can be up to 99 pages long, but the program is really designed for short documents or documents composed of short articles or sections; text files brought in using the Get Text command cannot exceed 5K bytes in size (about two pages of text). Once text is on the page, it can be formatted by selecting the text with the

With the $185 ClickArt Personal Publisher, graphics can be displayed and edited on-screen (top illustration) before being printed (bottom illustration).

mouse and choosing a font style from a pop-down menu.

Graphics, once they are brought onto a page from a library, may be cropped, inverted, or rotated. The package also includes simple graphics tools, giving you the ability to draw ruled lines, boxes, and circles. Fill patterns, however, are not available; you can't shade a box gray, for example.

ClickArt Personal Publisher is a good low-cost solution for aspiring PC desktop publishers whose projects are relatively simple. The package is easy to learn and easy to use, though it runs rather slowly, even on an AT. Software Publishing is committed to making later versions run quicker.

PFS:Professional File—Easy to Learn

PC HANDS ON

BY JOE DESPOSITO

Software Publishing Corp.'s new *PFS:Professional File* is as easy to learn and use as its predecessor, *PFS:File*, but it also includes some powerful new features such as crosstab reports and macros.

PFS:Professional File sports

new features and a new look. The main menu comes up in a window, and submenus are in overlapping windows. The input form is basically the same as that for *PFS:File*, except that at the bottom of the screen is a ruler and a menu bar with pull-down menus is at the top. Designing a file is exactly the same as in *PFS:File*.

The file manager has an in-

creased number of sort fields (64), backward scanning of records, and global updates.

Other improvements include an import and export function to copy *PFS* files to and from *1-2-3* worksheets and other ASCII files. A memory-caching feature speeds up searches after a few searches of the same data have occurred.

Macros are built by pressing Alt-0 from anywhere in the program. Keystrokes are remembered, so repetitive tasks can be easily automated. If necessary, the macro that you are building can pause for input.

Symphony 1.2 Plays Catch-up With Big Brother, Release 2

HANDS ON

BY ALFRED POOR

Lotus Development Corp.'s new version of *Symphony*, Version 1.2, adds a few of the statistical features that made their way into *1-2-3* when Release 2 of the top-selling spreadsheet was introduced last fall. But the most important advance of this *Symphony* upgrade is its ability to read the .WK1 files generated by *1-2-3*, Release 2.

Aside from this, most *Symphony* users will find little changed about the program's operation. But they will welcome the change in the copy-protection scheme.

No, Lotus has not yet joined the legions of software publishers who favor customer relations over locked products, but it has advanced from an antediluvian protection policy to one that is merely outdated. Unlike the past version of *Symphony* that could be run only with a floppy key disk, this version allows you to install a loadable version on your hard disk.

The Install program is supposed to work on all hard disks and Bernoulli Boxes, but I was unable to get it running on a Sysgen removable hard disk unit. I did manage to install it using the separate Copyhard utility without having to revert to the familiar key-disk-loading method.

Three of the new features are Application Add-ins (which are all in the Range command menu), Matrix, and Regression: Matrix and Regression are available to help with statistics calculations. There is also a Range Input command, similar to that found in *1-2-3*, Release 2, which gives you more control over data input during the execution of a macro.

In the Install program, you will encounter other signs of new features. There is now support for the Hewlett-Packard Laserjet Plus. In the Communications section, there is support for three file-transfer, error-detection protocols: Xmodem, B protocol (used by CompuServe), and BLAST (BLocked ASynchronous Transmission). Also, you can convert *dBASE III* files to and from *Symphony*.

Perhaps the best detail about the upgrade is that it is free for owners of *Symphony*, Version 1.1, and only $75 for Version 1.0 owners.

1-2-3, Release 2.01: Fewer Bugs, Faster

HANDS ON

BY CHRISTOPHER BARR

1-2-3, Release 2.01, is officially called "a maintenance release." If you already own Release 2, the $15 upgrade fee will get you a moderately faster spreadsheet engine. And if you're still perfectly content with Release 1A and have so far resisted Lotus Development Corp.'s call to upgrade, there's probably little reason to spend the $150 upgrade fee now.

Little has changed. Lotus fumigated a few known bugs in Release 2, speeded file retrieval time, and streamlined a couple of functions.

File retrieval proved to be roughly 25 percent faster. From an IBM PC-XT 10-megabyte hard disk, a 112,000-byte file was retrieved in 22 seconds with Release 2 and in 17 seconds with this year's model.

Release 2.01 labels are treated as zeros in mixed formula references, and financial functions will now accept negative arguments.

Among the bugs that have been fixed is the row-insertion problem (see this issue's Spreadsheet Clinic). In Release 2, after a column is formatted to the end of the spreadsheet, a row that is inserted will appear only to the right of the formatted column. You can lose data if you're not aware of how the row is split. Release 2.01 prevents you from adding the additional row.

Advance Look: Will Lotus's HAL Be the Ultimate Panacea for 1-2-3?

It looks as if *1-2-3* users will finally have their prayers answered on November 15, when Lotus Development Corp. plans to release *HAL*, a companion product for *1-2-3*, Release 1A, 2, and 2.01. *HAL* may prove to be a panacea for most of *1-2-3*'s short list of shortcomings.

Using about 108K bytes, *HAL* is memory-resident and works only with *1-2-3*; sitting on top of the worksheet's inverted L, it simplifies creating and working with spreadsheets.

One of its most important features is an Undo command that allows you to reverse the last command executed—even if it was /Worksheet Erase. It should also allow the creation of multidimensional worksheets; when information in the source worksheet is changed, the linked worksheets will be updated, too.

For the first time you'll be able to use English-language macros to perform most tasks and then call up a translate window to see how *1-2-3* executed your command, a great feature for learning to write macros. You can highlight all cells in a worksheet that are based on formulas, and highlight or list precedents and dependents, the cells that feed either into or off of another cell.

A Hands-On review will appear in the First Looks section of *PC Magazine* as soon as Lotus's final testing is complete. List price is expected to be $150.

—*Christopher Barr*

Sperry's PC/microIT: Stylishly Small AT

PC HANDS ON

BY WINN L. ROSCH

If I were IBM, I would be worried about Sperry Corp.'s PC/microIT. The new AT-compatible is stylishly small, surprisingly powerful, and emblazoned with the name of a long-standing competitor. Sperry is targeting this machine to its installed base of mini and mainframe customers, but it's come up with a PC that should please any power user.

The PC/microIT's 80286 processor operates at 6 or 8 MHz with one wait state or at 7.16 or 8 MHz with none. A socket is available for an 80287 numeric coprocessor.

When running at 8 MHz with no wait states, the PC/microIT is faster than IBM's best. Yet it's smaller than an ordinary PC, little more than the width of two disk drives (14 inches) and one full drive high (5 inches).

The PC/microIT's sharply angled plastic and metal case, colored a tan beige, makes the IBM PC look like a fossil. And the detail work is superb—even the nameplate rotates to keep the Sperry logo level should you choose the optional desk stand to mount the machine on end.

Inside the diminutive system unit you'll find five expansion slots, including three with the full 16-bit AT bus. The slots are oriented sideways—boards fit in horizontally—conserving height so that tall AT boards will squeeze into the short case.

In the machine reviewed, one 8-bit slot was filled with a display adapter, and a 16-bit slot housed a Western Digital hard disk controller. The floppy disk drive controller is built into the system board.

The narrow system board runs the full length of the chassis, sneaking under the 135-watt power supply, and stretches about half the width of the case. One serial port, one parallel port, and half a megabyte of RAM are standard features of the board.

The power supply is interlocked with the lid of the case. If you open up the system unit, the

power automatically switches off so you have no worries about dropping objects into a running computer or accidentally removing and ruining expansion boards when the system is hot.

The tiny size of the PC/microIT is partly a result of skimping on drive bays. The unit has room for only two half-height devices. The review unit came with a high-density (1.2-megabyte) floppy disk drive and a slow 20-megabyte hard disk.

Hidden behind a small plastic panel under the system security keylock is one of the cleverest features of the PC/microIT.

Slide down a small plastic panel with moderate finger pressure and you'll find two sets of DIP switches for selecting system speed, keyboard type, and monitor type. No more poking in the dark to change settings.

Three different keyboards are available with layouts similar to the three now made by IBM for the PC family. Although workable, the Sperry products lack the IBM key click and feel.

Monochrome, color, and enhanced color display systems

are available—all compatible with the IBM standards. In addition, the Sperry EGA system adds a Hercules monochrome graphics compatibility mode.

The construction of the PC/microIT gives the impression of a top-quality consumer product—a stereo component or video recorder—rather than a computer, possibly because it's manufactured by Mitsubishi in Japan. Solid, compact, and top quality, the PC/microIT is the shape of things to come in desktop computing.

VLSI technology helped Sperry shrink its AT-compatible computer, but skimping on drive bays saved the most space. At left, the older Sperry PC/IT; at right, the PC/microIT.

Benchmark Tests: Sperry PC/microIT vs the IBM PC-XT Model 286 and the IBM PC AT

The $3,590 Sperry PC/microIT (with a 20-Mbyte hard disk) tests faster than the $5,295 IBM PC AT mainly because its 80286 processor runs with no wait states. Priced lower than the $3,995 6-MHz IBM PC-XT Model 286, the diminutive PC/microIT clearly beats IBM in both pricing and speed.

The **128K NOP** benchmark is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The **Floating-Point Calculation** benchmark test measures processor speed by looping through a series of floating point calculations, including multiplication, division, exponentials, and logarithmic and trigonometric functions. This

test program uses the floating-point library included with Microsoft C Compiler 3.0.

The **1-2-3 Routine** benchmark compared the computational speed and RAM-management capabilities of the machine by using a 1-2-3 macro that performs a series of both global and individual worksheet tasks. The macro copies and recalculates a 10-cell range 49 times, moves 100 cells, deletes 100 cells, and then systematically clears the spreadsheet.

Normalized results
(Ratio: 6-MHz IBM PC-XT = 100)

Performance Times
(Times given in seconds and decimal seconds.)

Product	NOP	Floating Point Calculation	1-2-3 Routine
IBM PC AT Model 286 (6 MHz)	5.550	36.970	78.000
IBM PC AT (8 MHz)	4.170	34.410	73.810
Sperry PC/microIT (8 MHz)	4.230	27.300	58.090

Okidata's first laser printer, the Laserline 6, is a $2,195 6-page-per-minute unit that emulates the HP Laserjet.

Okidata Announces Low-Cost 6-ppm Laser Printer, 1,200-bps Modem

Printer maker Okidata has embarked on a flurry of product introductions with its first laser printer and PC modem.

The Laserline 6 laser printer costs $2,195 for a single-user version and $2,595 in a model adapted for up to three users. Rated for a print speed of 6 pages per minute, the Laserline 6 emulates Hewlett-Packard's

Laserjet and features 15 resident fonts and 128K bytes of RAM, expandable to 512K for $399.

The Okitel 1200 is a Hayes-compatible 1,200-bps external modem that automatically adapts to variations in line quality. It can be programmed to ignore spurious line interruptions, such as call-waiting signals.
List Price: Laserline 6, single-user, $2,195; three-user, $2,595. Okitel 1200, $449. Okidata, 532 Fellowship Rd., Mount Laurel, NJ 08054; (609) 235-2600.

CIRCLE **430** ON READER SERVICE CARD

1-2-3 Template Does Tax Reform Impact Analysis Based on New Tax Laws

Curious about how the new tax laws affect you? Research Press offers a *1-2-3*, Version 2.0, template that compares in detail the amounts you'll pay in 1986, '87, '88, and '89 against your 1985 outlay. *TRA86* is available for a $195 site-licensing fee; updates cost $50.
List Price: *TRA86*, $195; updates, $50. Requires: 640K RAM, *1-2-3* (Version 2.0), DOS 2.0 or later. Research Press Inc., 4500 W. 72nd Terr., Prairies Village, KS 66208; (913) 362-9667.

CIRCLE **429** ON READER SERVICE CARD

Tallgrass 40-Megabyte Tape Drive Backs Up at 3 Megabytes per Minute

Tape-drive maker Tallgrass Technologies Corp. has announced a 40-megabyte addition to its DC2000-based Grasshopper series. The 40-megabyte Grasshopper comes in an internal model for $995 and in an external unit for $1,295. Both units back up at speeds of 3 megabytes per minute and include *BackTrack* software, which backs up data any time the computer is idle. Tallgrass claims that its error-correction routine can reconstruct up to 4K bytes per 8K-byte block of data.
List Price: 40-megabyte Grasshopper, internal model, $995; external model, $1,295. Tallgrass Technologies Corp., 11100 W. 82nd St., Overland Park, KS; (913) 492-6002.

CIRCLE **431** ON READER SERVICE CARD

Lifetree Software's Words & Figures: Spreadsheet with a Word Processor

Lifetree Software, creator of the *Volkswriter* series of word processors, offers its $195 *Words & Figures*, a *1-2-3*-compatible (Version 1A) spreadsheet integrated with a full-featured word processor. Both word processing and spreadsheet modules have a *1-2-3*–style Slash menu interface, and users can import text into the spreadsheet or spreadsheet ranges into the word processor.

Perhaps the best feature of *Words & Figures* is that when the cursor reaches a chunk that has been imported from one module into the other, the program automatically switches cursors and

menus. And so it automatically treats spreadsheet ranges exactly like spreadsheet ranges even though they may have been imported into the word processor.

The spreadsheet supports up to 9,999-row by 256-column spreadsheets, reads *1-2-3* .WKS files, writes .WKS and .PIC files, and contains built-in auditing and EGA graphics support.
List Price: *Words & Figures*, $195. Requires: 256K RAM, DOS 2.0 or later. Lifetree Software Inc., 411 Pacific St., Monterey, CA 93940; (408) 373-4718.

CIRCLE **426** ON READER SERVICE CARD

Words & Figures, $195 from Lifetree Software, lets you fully integrate 1-2-3-compatible (Version 1A) worksheets with text.

Fox, WordTech Claim Big Performance Gains Using dBASE III Plus Compilers

Two companies are shipping compilers for *dBASE III Plus* source code that speed up and enhance standard database operations.

Fox Software's single-user *FoxBASE+* costs $395; a multiuser version that supports an unlimited number of users is available for $995. Fox claims performance increases of more than six times over *dBASE III Plus* and adds such enhancements as 120 extra procedures per procedure file, multiple relations per database, and direct access to *dBASE II* files.

WordTech Systems' $599 *Quicksilver* supports networked database operations, and it aids windowing support, linkage to C-language routines, and the ability to create independently executable run-time modules for the *dBASE III Plus* arsenal.
List Price: Single-user *FoxBASE+*, $395; multiuser version, $995. Requires: 640K RAM, hard disk drive, DOS 2.1 or later. Fox Software Inc., 27475 Holiday Ln., Perrysburg, OH 43551; (419) 874-0162.

CIRCLE **436** ON READER SERVICE CARD

List Price: *Quicksilver*, $599. Requires: 512K RAM, hard disk drive, DOS 2.1 or later. WordTech Systems Inc., P.O. Box 1747, Orinda, CA 94563; (415) 254-0900.

CIRCLE **437** ON READER SERVICE CARD

Clock/Calendar Add-in Fits Around Expansion Slot, Leaving It Free

You no longer have to buy a multifunction card or give up an expansion slot in your PC or XT to have the correct time at your fingertips. Innovations' $59.95 Sidelock case measures only 1.2 by 3.8 inches and plugs into an expansion slot so

that any other card can fit into the same slot. It has full clock and calendar functions and comes with a 5-year lithium battery and control software.

List Price: Sidelock, $59.95. Innovations Inc., 1669 S. Voss Rd., #880, Houston, TX 77057; (713) 728-0938.

CIRCLE 435 ON READER SERVICE CARD

Innovations' $59.95 Sidelock card fits into an expansion slot so that another card can fit into the same slot. It measures only 1.2 by 3.8 inches.

Battery-Backed RAM Unit Provides High-Speed, Nonvolatile Mass Storage

Inexpensive it is not, but for users who require high-speed non-volatile mass storage, Santa Clara Systems' Batram subsystem provides 4 megabytes of formatted battery-backed CMOS RAM, capable of transferring data at a rate of 3.7 megabytes per second. The price is $1,895 for the first 4 megabytes; $1,295 for each 4 megabytes thereafter, up to a total of 20 megabytes ($5,780)

per subsystem.

The Batram runs on standard AC current, rechargeable electrolytic gel batteries, which provide up to 2 weeks of reserve power, and the installation software lets you set up the unit as a DOS boot disk.

List Price: Batram subsystem, $1,895 for 4 Mbytes RAM; $1,295 for each additional 4-Mbyte add-in card. Santa Clara Systems Inc., 1610 Berryessa Rd., San Jose, CA (408) 729-6700.

CIRCLE 434 ON READER SERVICE CARD

Static Dissipation "Mouse," Power Director/Monitor Stand Space-Saver

Two products are intended to make life more convenient for users and safer for PCs.

Static Clear, $24.95 from Microcomputer Accessories, attaches to the center screw of any standard wall outlet and protects PC components from static-electricity damage. Pressing a button in the center of the mouse-size unit causes it to display an LCD "lightning bolt" if a static charge is present. Pushing the button for about 2 seconds then dissipates the static.

Scooter Products claims that its $79.95 Scooter, Model SP500MA, monitor stand also serves as a power director and surge suppressor. The stand's five protected sockets corre-

spond to individual front-panel rocker switches. Also included are a power on/off switch and a resettable circuit breaker. The tilt-and-swivel base allows a tilt position to be locked in without affecting its ability to swivel.

List Price: Static Clear, $24.95. Microcomputer Accessories Inc., 5405 Jandy Pl., Los Angeles, CA 90066-0911; (213) 301-9400.

CIRCLE 432 ON READER SERVICE CARD

List Price: Scooter, Model SP500M, $79.95. Scooter Products, Ohm/Electronics Inc., 746 Vermont St., Palatine, IL 60067; (800) 323-2727.

CIRCLE 433 ON READER SERVICE CARD

The $24.95 Static Clear protects PC components from static-electricity damage.

Two Low-Profile 16-Bit Multifunction Boards That Fit in the XT, Model 286

IBM Corp. added confusion to the PC market with its recent introduction of the PC-XT, Model 286. The Model 286 is an 80286-based machine with a

The $695 Multi 3 AT card includes RAMdisk and print spooler software.

16-bit bus whose case is not tall enough to accommodate add-in cards made to the AT's taller spec. Two memory card makers immediately claimed they had the answer.

Trade Ventures International sells its low-profile

Mem-AT+ for $500 with 0K bytes of RAM and its Multi 3 AT, a multifunction card, for $695 unpopulated. The Mem-AT+ can hold up to 3 megabytes of Lotus/Intel/Microsoft expanded memory specification RAM; the Multi 3 AT holds 2 megabytes and includes two serial ports and a parallel port.

Computer Peripherals' $595 Overachiever board includes 128K bytes of RAM expandable to 1.5 megabytes on board and to 3 megabytes with a (daughterboard), a parallel port, two serial ports, a game port, and a clock/calendar.

List Price: Mem-AT+, with 0K, $500; with 3 Mbytes, $1,495. Multi 3 AT, with 0K, $695; with 2 Mbytes, $1,395. Trade Ventures International, 512-A Herndon Pkwy., Herndon, VA 22070; (703) 435-3800.

CIRCLE 427 ON READER SERVICE CARD

List Price: Overachiever with 128K RAM, $595; with 1.5 Mbytes, $895; 1.5-Mbyte expansion board, $645. Computer Peripherals Inc., 2635 Lavery Ct., Newbury Park, CA 91320; (800) 854-7600; (805) 499-5751 (in Calif.).

CIRCLE 428 ON READER SERVICE CARD

Volkswriter Deluxe Plus: More Features, Faster Performance

PC **HANDS ON**

Volkswriter was one of the first word processors for the PC. After a few rather ordinary revisions, Lifetree Software has added a spelling checker, increased the speed, and lowered the price.

BY JON PEPPER

Volkswriter Deluxe Plus is a program that single-handedly dignifies inexpensive software. Low-cost word processing software used to have a somewhat sullied reputation, mainly because it just didn't have the power or support of best-sellers such as *WordPerfect*, *Microsoft Word*, and *MultiMate*.

Then when companies realized that not everyone wanted or could afford $495 for word processing software, *Just Write* (from Ashton-Tate) and *Easy* (from MicroPro International Corp.) were introduced to fill gaps in the product line. But while the theory was right, these products were really just starters in a migration path to their companies' more-powerful offerings. For the budget-minded word processing user, *Volkswriter Deluxe Plus* might be just the right program.

Tangled History

One reason *Volkswriter Deluxe Plus* is attractive is that it isn't a scaled-down version of existing software but is actually an upgraded version of a product that once sold for $295.

See if you can follow this: In the beginning there was *Volkswriter*, which, after several revisions, became *Volkswriter Deluxe*, Version 2.2. When Version 2.2 was upgraded to *Volkswriter 3*, the *Deluxe* sort of disappeared from the name. When Lifetree resurrected Version 2.2 as *Volkswriter Deluxe*, it added a spelling checker

with a 100,000-word dictionary and automatic reformatting and dropped the price to a mere $99. Whew!

The price may be low, but *Volkswriter Deluxe Plus* is a first-rate word processor throughout. The product, which comes on two disks, installs easily via batch files. Typing VW brings up an opening menu that uses single-key mnemonics to access major functions (R for retrieve a file, P for print, and so on). A status line at the bottom of the screen shows the logged drive, active filename, message area, and the line, page, and column numbers.

The reasonably full complement of word processing functions can be accessed by using the function keys, either alone

or in combination with Alt, Ctrl, and Shift. The program also supports *WordStar*-like embedded dot commands (for example, ..PAGE forces a page break; ..END stops printing). While this isn't the most sophisticated interface, it functions well and has the advantage of being comfortable for users of both *WordStar* and older versions of *Volkswriter*.

Such users of older versions, particularly of *Deluxe*, Version 2.2, will feel right at home with *Volkswriter Deluxe Plus*. Everything is here, only more so. The dictionary spelling checker is excellent and identical to the one used in the more expensive *Volkswriter 3*.

My only complaint about the spelling checker is that it doesn't automatically suggest alternative spellings for unknown words, demanding an extra keystroke for each mismatch—a process that becomes tiresome in long documents. The other new feature—automatic paragraph reformatting—is a welcome addition.

Volkswriter Deluxe Plus is fast, and I found that several users of far more expensive programs were impressed by the speed. If you're disappointed with the low-cost performance of *Volkswriter De-*

luxe Plus, you probably thought Scrooge was the good guy in the Dickens story.

Perhaps more surprising than the speed of this inexpensive product is the range of features and nice touches supported: TextMerge for forms support, a utility that supports 43-column displays with an EGA board, an excellent tutorial, a notepad, format sheets, horizontal scrolling, and high-speed key repeat on ATs.

Sparse On-line Help

Volkswriter Deluxe Plus may lack some of the more sophisticated functions of high-end programs (though not too many), but those it has are very easily accessible and easy to learn. The on-line help function is sparse, and the disk-based tutorial is adequate. The manual is well written, and Lifetree offers a 60-day money-back warranty on the program.

Worth the Upgrade

If you are thinking about upgrading to *Volkswriter Deluxe Plus* from Version 2.2, the spelling checker and the automatic paragraph-reformatting feature make it worth the trouble. If you are looking for inexpensive but worthwhile word processing software, *Volkswriter Deluxe Plus* more than holds its own against the competition. It is easily one of the best word processors in its price range.

Volkswriter Deluxe Plus's spelling checker suggests alternative spellings for words that it recognizes and lets you add unfamiliar words to the dictionary.

Microsoft Mouse, Version 6.0, a software upgrade, provides menu support for business applications such as *DisplayWrite 3*, *Multi-Mate*, and Lotus Development Corp.'s *1-2-3*, and incorporates *Show Partner*, Version 2.0, to allow users to capture PC images, create graphics, and assemble sequential slide-show presentations. In addition, Microsoft Corp. has included the latest version of *Microsoft Paintbrush* with the Mouse package. Upgrades are free for registered users who purchased Microsoft Mouse after August 1, and $50 for all other registered users. Microsoft Corp., Redmond, Wash.; (206) 882-8080.

* * *

Nantucket Corp. has released the autumn '86 version of *Clipper*. The new version is capable of compiling both single-user and networking applications, and it supports the use of expanded memory. It also runs compiled applications on most major networks, including IBM Corp.'s Token-Ring Network and 3Com Corp.'s 3+ Network Operating System. Upgrades are $139 for registered users. Nantucket Corp., San Fernando, Calif.; (818) 365-6986.

* * *

A Japanese version of *1-2-3*, Release 2J, is designed to work with the NEC 9800 family of DOS-compatible personal computers. It includes all the features of the American version of *1-2-3*, plus kana-to-kanji conversion (in which a normal keyboard is used to enter all

For 98,000 yen ($640), you can buy the Japanese version of Lotus's 1-2-3, which uses over 7,000 characters of the Japanese alphabet.

7,000 characters of the Japanese alphabet), graph types and functions commonly used in Japan, and Japanese date formats. While the new version will be marketed for Japanese corporations, it will also be made available to their U.S. subsidiaries. The price is 98,000 yen, or about $640. Lotus Development Corp., Cambridge, Mass.; (617) 577-8500.

* * *

Foresight Resources has added the *Drafix DotPlotter* to its *Drafix I* CAD product. The $45 software add-on will provide Drafix CAD users with high-resolution output on inexpensive dot matrix printers, eliminating the need for pen plotters. Foresight Resources, Lawrence, Mass.; (800) 231-8574.

* * *

PowerBase, Version 2.2, accommodates more records in a file with multiple-indexed files, links data with *WordPerfect*, and runs unattended with macro packages such as Borland International's *Super-Key* and RoseSoft's *ProKey*. Upgrades are $25 for registered users of Version 2.1 and $75 for registered users of earlier versions. A conversion program is included with upgrades to make applications

IBM Lowers the Price and Adds Memory to the RT PC

IBM Corp. has unveiled an enhanced version of the RT PC and has lowered prices for the rest of the slow-selling 32-bit RT line by 20 to 32 percent.

The new RT PC 6151, Model 15, features twice the standard internal memory (2 megabytes) and almost double the disk-storage capacity (70 megabytes) of the current desktop RT PC 6151, Model 10.

Newly available options for current RT models include a 4-megabyte memory expansion card and an accelerator card that IBM claims will triple the speed of floating-point calculations. An upgrade to Advanced Interactive Executive (AIX 2.1), the RT's UNIX-based operating system, allows 16 concurrent users—double the previous number. AIX's price was cut by 32 percent, to $2,295.
—*Jonathan Matzkin*

created with previous *PowerBase* releases fully compatible with *PowerBase*, Version 2.2. Compuware Corp., Birmingham, Mich.; (313) 540-0900.

* * *

In brief: Shipments of Tandy's $799 1000 EX and $1,199 1000 SX DOS-compatible PCs have begun. Lack of certification by the Federal Communications Commission delayed sales of the computers by several weeks. Tandy/Radio Shack, Fort Worth, Tex.; (817) 390-3921 . . . Micro Data Base Systems has lowered the minimum commitment needed to qualify for site licensing on *Knowledge-Man/2*. Now as few as 50 PC-DOS or MS-DOS units qualify for site-licensing price, and customers can mix environments to qualify for the minimum. Micro Data Base Systems, Lafayette, Ind.; (317) 463-2581 . . . Intex Solutions upgraded *X-Y-Z: Consolidate* to Version 2.2 and *X-Y-Z: Query* to Version 1.2 to make them compatible with Turner Hall Publishing's *SQZ!*, Version 1.5. Registered users can upgrade for $25. Intex Solutions, Wellesley, Mass.; (617) 431-1063 . . . Walonick Associates has added a quality-control and forecasting module to *StatPac Gold*. The module includes new time-series analysis techniques, presentation-quality graphics, and 11 forecasting techniques. Upgrades are $195. Walonick Associates, Minneapolis, Minn.; (612) 866-9022 . . . Enhancements to Version 3.0 of *Carbon Copy* include remote printer support, automatic log-in, and support of interactive graphics. Registered users of Version 2.14 can upgrade for $25. Meridian Technology, Newport Beach, Calif.; (714) 476-2224 . . . Miller Microcomputer Services has released Version 2.4 of *MMSFORTH*. Registered users should contact MMS at (617) 653-6136 for upgrade information . . . Verbatim Corp. has added a specially treated liner to its DataLife disks that guards against possible data loss caused by static electricity. Verbatim Corp., Sunnyvale, Calif.; (408) 245-4400 . . . *DataFlex* owners can now access free DataFlex public-domain programs, including instructive *DataFlex* programs, utilities, and techniques. The programs are available for downloading from the toll-free DataFlex Bulletin Board at (305) 238-0640. *DataFlex* users who do not own a modem can order a $25 Public Domain Disk containing 30 programs. Data Access Corp., Miami, Fla.; (305) 238-0012 . . . West Publishing Co. has added access to state statutes to its WESTLAW legal on-line database. Illinois state statutes are presently on-line, and other statutes will become available on a regular basis. West Publishing Co., St. Paul, Minn.; (612) 228-2500.

CADWrite: Competent CAD For the Heavyweight Division

PC **HANDS ON**

> Flexible geometric editing, an excellent dimensioning system, and a library of more than 1,900 symbols give IBM Corp.'s $1,995 CADWrite design system plenty of appeal. But users of non-IBM hardware may be out of luck.

BY GLENN HART

CADWrite, IBM Corp.'s new computer-aided design program, is derived from Fastdraft, a Series 1 CAD system marketed by IBM from 1982 to 1985. Fastdraft was ported to the IBM PC family and customized to that hardware environment and DOS.

IBM specifies only IBM-brand hardware for use with CADWrite. There are many compatible devices, but, even so, the hardware choices are rather limited. CADWrite uses the Virtual Device Interface (VDI) standard for interfacing to hardware. VDI drivers for many other devices are avail-

able from third-party sources, but IBM is offering no help in setting up such interfaces.

The main CADWrite program is huge—about 850K bytes. Batch files manage file copying, but figuring out how to set up the VDI interface is complex and poorly explained. Installation is one of the program's weakest links.

Like most CADs, CADWrite displays an on-screen menu from which you make your command choices. CADWrite's menu isn't split into functional groups; it's simply an alphabetical list of the available commands. This type of design has advantages and disadvantages: the command you want is easy to find; you don't have to make multiple picks as you move through a menu tree; however,

there are many menu choices, and you have to skip around because functions frequently used together aren't adjacent.

The program prompts for the information it needs at the top of the display. Various options appear on the prompt line when appropriate. Some options are selected with the pointer, while others use function keys. The normal CAD drawing aids are provided, including free roaming graphics and both a visible grid and a snap grid for exact cursor positioning, both of which can be disabled.

There are several quirks in the user interface, but the overall feel is rather good. You can learn to navigate through the system's options faster than with some other CADs.

The list of features provided is extensive. Several uncommon drawing entities are available, including both open and closed belts, arcs and splines, as well as the normal lines, circles, arcs, ellipses, boxes, and polygons. Automatic object snap makes it easy to locate points and objects. Freeform sketching is provided, too.

Geometry editing provisions are comprehensive and flexible. Objects can be flipped, moved, rotated, and scaled, and panning and zooming is good. Text

manipulation is good, though only one font per drawing is allowed. You can prepare large blocks of text with a word processor and bring them directly into CADWrite.

CADWrite includes an excellent dimensioning system. Three extremely large symbol libraries, with over 1,900 symbols, are furnished. CADWrite is a two-dimensional system, but it features a semiautomatic isometric system that projects top and side views of an object into an isometric view.

There are a few major omissions: no on-line help system and no macro system or programming language. The attribute tagging system is limited. A more serious drawback, perhaps, is that CADWrite can't display or plot wide lines.

Aside from the installation difficulties, IBM's documentation is unusually good. Both a detailed reference section and a 15-lesson tutorial are included in two volumes of well-illustrated manuals.

Overall, we were impressed with CADWrite. We think it's fully competitive with AutoCAD and other microcomputer CADs in the heavyweight price bracket. As with any program, some aspects of its operation are a matter of personal preference, and some functions are missing, too, but, in general, CADWrite has much to recommend it. ▣

CADWrite vs. Fastdraft

IBM Corp.'s earlier incarnation of CADWrite, called Fastdraft, was offered as part of a Series 1 minicomputer turnkey system that cost more than $100,000 and supported two users.

The advantage of the Series 1 system over the PC version is the vector display, in which electron beams write to screen steadily, producing a much sharper image than the rasterbased PC display, which needs to be refreshed constantly.

But because the Series 1 display produced only 7,000 vectors, shading was out of the question. CADWrite on a PC, therefore, can draw more-complex images than the Series 1 package. —*Gus Venditto*

New Pnt
Attrib
Att List
Belt
Box
Chamfer
Circle
Copy
Delete
Dimen
Ellipse
Fill
Fillet
Flip
Interrupt
Isometric
Leader
Line
Measure
Modify

Installing the VDI interface in IBM's $1,995 CADWrite is no easy task, but once set up, you will be impressed with this program's overall features.

In Hex, It's a 5A Car

Vanity plate seen on a Nissan 300ZX in Columbus, Ohio:

ALT-90

What does it stand for? Hold the Alt key down on a PC, then enter 90 (or 090) on the numeric keypad, and you get the ASCII code for 90: a Z, as in Z-car.

All the News That's Fit to Print

"MS-DOS also limits the amount of random access memory, or RAM, the active memory for applications, to 512K. However, the 512K barrier, as it soon became known, has been circumvented by hardware/software memory combinations available as add-on boards."
—*The New York Times*, September 9, 1986

Hello, Purchasing Department? Cancel the Deskpro 386 . . .

In the genre of burning Yule logs on cable TV at holiday time, Jersey Cow Software/Cognetics of Princeton,

N.J., offers *Fishies*, a $14.95 program that fills the screen with images of fish. It runs only on the Apple II family.

IBM, eat your heart out. If you want to see little fish swim across your screen in an aquatic environment, you need an Apple.

Next Month: The Famous dBASE III Word Processor

"Also available are real estate templates that customize and adapt popular spreadsheet programs such as *MultiMate*, Lotus 1-2-3, *VisiCalc*, or *Super-Calc*."—*American Way* inflight magazine, September 16, 1986

Heard or seen anything offbeat, unusual, or just plain dumb about the computer industry? Send your offerings to Communiqués, PC Magazine, One Park Avenue, New York, NY 10016; (212) 503-5293 or MCI Mail 157-9301.

Contributors receive $50 and a PC Magazine T-shirt.

Contributors to this issue's Communiqués: Mike Ozzing (license plate), Edward Gordon (PC regastition), Peggy Garvin (Fishies).

The Infrared Mouse That Cuts the Cable

PC HANDS ON

BY WINN L. ROSCH

With the Manager Mouse Cordless from The Torrington Co., free-form editing and drawing win new freedom. This mouse operates without restrictive wires or a special mousepad.

Resembling most mice in color, size, and shape, the graybeige rectangular Cordless has three large, bar-shaped pushbuttons and is equally comfortable under the right or left hand.

Two green eyes (infrared LED transmitters) and internal batteries substitute for the traditional umbilical connecting cable. A silver mouthlike jack allows plugging in a battery charger if current gets low—an overnight charge can last for days—but the mouse signals always travel optically.

Like Torrington's earlier Manager Mouse, the Cordless uses two tiny plastic wheels set at right angles to each other, in-

stead of an optical detector or trackball, to detect movement as fine as 1/100 of an inch. Torrington claims the system is less prone to collecting dirt and needs less maintenance than other mice, and our testing tends to bear that out. It works quite well on ordinary, cluttered desktops, including those covered with dust and other particulate matter.

The mouse stares at a small receiver, about half its size, that has a big, red picture window on its front surface to receive the mouse's invisible glow. A tiny, red LED flickers in the upper

Manager Mouse Cordless: infrared signals let you run any mouse-compatible software from across the room.

left part of this window when the mouse's transmissions are detected.

The receiver connects by cable to a serial port and a small black transformer. When needed, the charging cable for the mouse also plugs into the receiver so you can recharge as you work.

The light beam transmission scheme is amazingly accurate, and the freedom it affords is wonderful and quite sufficient to justify the product and its higher price. Its several-foot range is more than adequate if both the mouse and the receiver are kept on the same desktop.

Errors creep in at the edges of the coverage of the mouse's eyes. Rapidly rotating the Cordless breaks its infrared pulse train and results in the reception

of erroneous instructions. Some form of error-checking or correcting protocol in the mouse's transmissions would help prevent such inaccuracies.

The Cordless is code-equivalent to Mouse Systems Corp.'s PC Mouse, so the Cordless can use under that company's drivers. Torrington supplies its T-Mouse software driver, which provides Microsoft Mouse compatibility. Another program, *KeyFree*, which is available from Torrington for $59, adapts its 1-2-3, *R:base Series 5000*, and *MultiMate*, not designed to use a mouse.

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■ QUICK LOOKS

RIX SoftWorks' EGA Paint: Freedom from Icons

PC HANDS ON

BY GERARD KUNKEL

Every now and then a graphics program comes along that is so well thought out, you don't even need to read the manual. *EGA Paint,* from RIX SoftWorks, is such a program.

The basic components match those found in a long line of EGA paint programs that have come before: 640- by 350-pixel resolution, 16 simultaneous colors out of a total palette of 64, and on and on.

Contrary to current conventions, *EGA Paint* does not offer its menu of functions in the form of icons. Instead, the program

uses simple words in pop-up menus. Using a mouse, you can point and select on the menu.

One of *EGA Paint's* out-

Using the $84 EGA Paint, all 64 colors of the EGA graphics card are made available. Shown is the intuitive English-language pop-up menu, used in place of icons.

standing features is zoom capability. While all paint programs offer zoom, this one stands out. You can scroll around the screen as if you had a magnifying glass scanning across a page. You also can access the menus to change colors.

Included in the available shapes are the usual box and circle features, but missing is the ability to fill those boxes or circles when created.

Included with *EGA Paint* is a second program called *EGA Slide*, a presentation package for scripting screen displays with fancy dissolves.

List Price: *EGA Paint,* $84.
Requires: 384K RAM, an EGA display adapter and monitor. RIX SoftWorks Inc., #470, Irvine, CA 92715; (714) 476-8266.

CIRCLE 443 ON READER SERVICE CARD

HomeBase 2.0 Cuts RAM Demand, Adds Features

PC HANDS ON

BY STEPHEN SAGMAN

Last fall, *PC Magazine's* editors liked *HomeBase* enough to make it an Editor's Choice among desktop organizers. But its mammoth RAM demand—167K bytes—stopped the editors from recommending it for everyday use.

HomeBase, Version 2.0, a fresh release from the program's new owners, Brown Bag Software, improves the package in several ways. The installation procedure is better, available work space within applications has been increased, and some new features have been added.

But the memory problem is only partly solved. The developers have pared the code so only 80K bytes remain resident in RAM. The program pulls code from disk as an overlay when needed. With a RAMdisk installed, the whole process takes only a second or two.

With a hard disk, however, it takes much longer.

Even though the new memory-management scheme often makes *HomeBase* sluggish, the wait is worthwhile.

The program includes a surprisingly complete set of modules: a calendar, file manager, text editor, database, telecommunications terminal, calculator, and cut-and-paste feature. Also thrown in are four utilities that you may already be using: a screen-saver, an on-screen digital clock, an expandable type-ahead buffer, and a "speed key" feature that increases a key's repeat rate.

List Price: *HomeBase,* Version 2.0, $69.95 (upgrades free within 30 days of ordering, $29.95 thereafter). **Requires:** 256K RAM, two disk drives, DOS 2.0 or later. Brown Bag Software, 2105 S. Bascom Ave., #164, Campbell, CA 95008; (800) 523-0764; (800) 323-5335 (in Calif.).

CIRCLE 444 ON READER SERVICE CARD

AST Advantage Premium: Nothing Exciting, Just A Well-Made EMS Board

PC HANDS ON

BY GLENN HART

When we recently reviewed the SixPakPremium multifunction card from AST Research, the inventors of the multifunction board, we found it to be a high-quality multifunction board that supported the Lotus/Intel/Microsoft expanded memory specification (LIM EMS), as well as AST's Enhanced LIM Superset (EEMS).

Now AST has released an AT version, called the AST Advantage Premium. It also supports EMS and EEMS and offers a similar array of memory and input/output options. The card is supplied with one serial and one parallel port; a second serial port and a game port are optional. *DESQ*, a multitasking program manager, and several utilities are included. The Advantage Premium accommo-

dates 1 megabyte of RAM, and an optional piggyback card can hold another megabyte.

Twenty-six switches and an array of jumpers are used to configure the card. It's not the easiest installation, but the documentation is reasonably clear.

Our board was supplied with 120-nanosecond RAMs, and it worked fine at speeds of up to 10 MHz in an IBM PC AT.

The Advantage Premium isn't a particularly exciting board, but it does everything it's supposed to do without fuss or bother. There are less-expensive cards, but AST's solid designs may be worth more to you.

List Price: AST Advantage Premium, $695 with 512K; second serial port, $50; game port, $50. AST Research Inc., 2121 Alton Ave., Irvine, CA 92714; (714) 863-1333.

CIRCLE 445 ON READER SERVICE CARD

You may or may not know the primary, basic reasons for choosing data cartridge technology for your backup.

It's easier to handle than big disks or boxes of floppies.

It stores more than any other method on your PC. Up to 150 megabytes in 5¼ inches of space.

It costs less per formatted megabyte of storage than any other removable mass storage for the PC user.

And most importantly, data cartridges have unsurpassed reliability over other media.

Relying on a second hard disk to do your backup, for example, is putting your faith in a medium that is famous for losing data. Whether it's caused by operator error (of which there are many) or the fickle finger of fate, crashing is what hard disks do — what created the problem in the first place.

The tough plastic cover protects the tape from problems that can occur with floppies.

A metal plate prevents tape alignment problems that can cause slipping and jamming. A problem that can cause data loss in cassettes.

But if you act before December 31, 1986, there are some other, alternative reasons for joining the data cartridge club:

A free cartridge from 3M if you buy your hardware from one of the participating manufacturers.

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For a free 16-page buyers guide detailing these offers, you can call (800) 835-2246 ext. 260. (In Kansas call (800) 362-2421 ext. 260.)

Or better still, just amble on down to your computer products retailer to see who's offering what.

And get your backup system while the gettin's good.

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3M data cartridge technology

HP's Gallery Collection: Is it Better Than Lotus' Freelance?

HANDS ON

BY MARVIN BRYAN

With a couple of quick one-two punches, Hewlett-Packard Co. has the potential to send professional software competitors to the mat with its new entry, *The Gallery Collection.* The Gallery Collection consists of two programs—*Charting Gallery* and *Drawing Gallery*—that combine to provide powerful PC presentation-graphics capabilities. It's a duo with more features and greater flexibility than Graphic Communications' top-selling *Freelance.*

Special features include the ability to import *1-2-3* worksheet graphs (not .PIC files, but ranges defined as graphs in .WKS files) directly for graphics enhancement, the ability to output 35mm slides on HP's 7510A film recorder, speedy production of organization charts and flowcharts, and a portfolio of prefabricated illustrations that users can stretch, size, and color to their own tastes.

Installation is not easy; the install files are not compatible with some RAM-resident programs. Once it's installed, though, *The Gallery Collection* software is a pussycat.

You can buy either *Charting Gallery* or *Drawing Gallery* separately if you prefer. Chart-ing Gallery by itself is not especially impressive, but it is easy to use. You enter separate modules from DOS, called PIE, BAR, and LINE, to produce the type of graph you want.

In the PIE module, you can explode segments of your pie charts and change textures or colors. The LINE module will produce scatter plots and line charts. The BAR module is capable of vertical- and horizontal-stacked or -clustered bars.

Since many graphics packages will produce any of these, all of this is nothing special. The dazzling part comes when you call a *Charting Gallery* graph up from the same subdirectory into *Drawing Gallery,* change text into a wide variety of fonts and styles, move elements, resize them, and then enrich the output with pictures, borders, and symbols. You can also draw in free hand, using a mouse as an input device.

The canned pictures rate special praise; *The Gallery Collection* has more than 330 professional images, enough to illustrate a wide range of business-related ideas. You can add symbols for $95 per module.

The program even has standard business forms that you can reproduce and customize to your heart's content.

As with the type styles, you can stretch a picture image to any direction, changing propor-

Hewlett-Packard's The Gallery Collection has a stock of more than 330 symbols that can be merged with the program's charts, flowcharts, or business forms.

tions to suit your taste and to fit available space. You can also enlarge or reduce the image, retaining the proportions if you prefer. You can insert one image inside another and tell the program to make it fit; you can also add color up to the limits of your printer's or plotter's range.

There are no help screens, but command choices appear in a border that completely surrounds the work area.

The Gallery Collection is an excellent entry in the presentation-graphics arena.

IBM Adds SMDR Data To Token Ring Network

Several new programs from IBM Corp. extend systems network architecture (SNA)–based network management capabilities to include non-SNA and non-IBM devices and to allow public branch exchange (PBX) communications management from within IBM's Token Ring and other networks.

PC-compatible *NetviewIPC* allows central site operators to perform oversight tasks and to troubleshoot on a Token Ring network that includes non-IBM and non-SNA hardware. The $2,000 program provides an applications programming interface to allow development of SNA management software on non-IBM computers.

"IBM has taken a step toward legitimizing networks by including local area networks in the management system," says Bob Bressler of the Applications Software Division of 3Com, a networking firm.

But Craig Burton, vice president of marketing at Novell, points out that IBM strategy involves "providing the network for the work group while still using terminal emulation for departmental processing." He sees opportunity for firms to provide solutions in situations in which IBM continues to push mini or mainframe systems.

Two *NetviewIPC* companion programs—*Alert Monitor* and *Call Detail Callectar*—extend network management to voice communications. *Alert Monitor* allows networkwide monitoring of call-detail-recording/station-message-detail-recording (CDR/SMDR) data at a *NetviewIPC* host. *Call Detail Collector* allows collection of CDR/SMDR data at one location from up to ten computerized branch exchanges (CBXs).

IBM is now selling the Token Ring Network Adapter for connecting 3270 PCs and ATs to the Token Ring network. —Jonathan Matzkin

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■ **FROM THE EDITOR'S SCREEN** ■ BILL MACHRONE

THE DEATH OF GOOD SOFTWARE

A day of reckoning is coming for all software companies. State-of-the-art hardware begs for the fast development of a new generation of software products.

There's no more good software. Fast machines and big memory have all but killed the art of writing good code. Time was when programmers used to take pride in how compact and quick their code was. After all, the early personal computers were limited to 64K and ran with slow 8-bit processors. Big 8-inch floppy disks spun continually and held a generous 241K.

Before you think that I'm going to descend into a maudlin remembrance of Z80-based machines and how great they were, let's get one thing straight: The good old days were terrible. The machines weren't reliable; the limitations were awesome.

But adversity breeds creativity. From those humble beginnings came *WordStar*, *dBASE II*, *Crosstalk*, and Microsoft BASIC. Virtually all applications programs were written in assembly language. They had to be. The high-level languages of 7 or 8 years ago produced code that was too big, too slow, or both. The letters columns in the magazines of the day dealt with how to do a hexadecimal-to-ASCII conversion in only 6 bytes or a printer driver in 25.

Programmers were sharp; they knew the value of a byte. Memory was a precious resource to be conserved. Then came the IBM PC. Its 8088 could address a megabyte, 640K of which was available to applications programs. It seemed like we'd never want for memory again.

SPREADSHEET HOGS But other forces were at work. The PC's enormous address space made it a natural for *Visi-Calc* and *1-2-3*. Spreadsheets gobble up data memory like starving wolves. The architecture also made it easy to write RAM-resident programs; more memory disappeared. Then compilers began to improve and more applications were written in high-level languages. They weren't as fast or as compact as their assembly language equivalents, but they could be developed much more quickly. Some companies lost their feel for the machine.

One of the saddest examples of this loss of feel for the hardware is MicroPro International's *WordStar*. It was the best-selling pre-PC word processing program. *WordStar* was incredibly rich in features, if somewhat hard to learn. When MicroPro translated the program to run on the PC, it had an instant winner.

But MicroPro lost its vision and its good programmers. It lost its feel for how a word processing program should perform on the PC. It failed to upgrade its star product. The company also got bogged down in extraneous, energy-sapping projects, such as the inappropriately named low-cost word processor *Easy* (it isn't), which is one of the slowest word processors I've ever encountered.

Not to pick on *Easy*, but why is the program such a pig? Was it the compiler or the programmers? My guess is that it was both. It's a perfect example of what happens when a company loses sight of its mission.

THE RECKONING A time of reckoning is ahead for virtually all software companies—a chance to reexamine their positions in the marketplace. The world is awash in 80286 machines, and the 80386 is emerging rapidly. The long-awaited protected-mode DOS will be available soon. When it comes, each software vendor will have to consider what products could or should be rewritten to take advantage of multitasking. Owners of PC ATs and AT compatibles will have to decide if it's time to expand beyond 640K and use the new DOS.

Whatever happens, a lot of code will be rewritten. Microsoft's development kit for protected-mode DOS will doubtless be oriented to its C compiler, since it is a staunch C proponent. But you can write slow code with the best C compiler, too. This is the chance for software authors to clean up their acts once and for all. They need to face up to junking, not recompiling, most of their code.

Today's software developer has a daunting arsenal to choose from in the war against slow code: optimizing compilers,

■ FROM THE EDITOR'S SCREEN

modular compilation, hardware break-pointing, and symbolic debuggers. Too often, however, I see developers use these tools to get the program working, then quit. If they don't go in and analyze the hot spots, and either recode them in assembly language or otherwise tune them, they haven't done the job.

One thing is certain: no matter what the operating environment or hardware, tight, well-written code will run better than piggy, mass-produced code. Indeed, multitasking may absorb much of the speed increase from the new hardware. Tomorrow's bells-and-whistles word processor running under protected-mode DOS on the hottest machine around is not likely to be any faster than today's less-capable equivalent.

MIPS MIPS (million instructions per second), unfortunately, are an inelastic resource. You either conserve them or the price skyrockets. You can see the effect with the prices of the new 80386 machines and of the faster accelerator cards. Nevertheless, everyone casts a covetous eye toward each new increase in MIPS. Database designers want to put some of the more mundane maintenance functions in the backround so that the interactive portion of the database becomes faster. Word processor designers want to offer spelling checking and a thesaurus in real time without hurting screen/keyboard performance. They may also want to do graphics and WYSIWYG. Spreadsheet designers never want to have to turn off recalc. And everyone wants to run some kind of communications with their applications. Meanwhile, the operating system needs MIPS in order to execute all the new tasks that people want it to perform.

Users have long suspected that the real purpose of software is to sell more hardware, not to get work done. This will likely be the case for protected-mode DOS software.

Once this happens, the user community will be divided into the "haves" and the "have-lesses." Ideally, the 286- and 386-based machines will have faster context switching and super-easy, super-powerful applications. But there is a danger that these machines and their software will begin to resemble the bloated land yachts of the early 1970s: power everything, stereo FM radios, plush upholstery, and utterly out of touch with reality.

Today's single-tasking DOS machines may evolve into nimble sports cars: fast, single-purpose machines that are unbeatable when doing what they were designed to do.

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■ JOHN C. DVORAK

THE NETWORK SHELL GAME

William "Buzz" Bloatman sells local area networks on a street corner. He calls his profession 3Com Monte, and his wares sell like hotcakes as Dvorak looks on helplessly.

I couldn't believe it the other day. There on the streets of New York was super-salesman and part-time venture capitalist William "Buzz" Bloatman. He had pulled up a cardboard box and tossed over it a brown Navajo blanket. He hung a sign. It said: "Local Area Networks—available here—cheap." Suddenly, from a pocket, out came three shells and a pea.

"Here we go," said Bloatman, rolling the pea from shell to shell. Each time he revealed the pea it was a different color. "Here we go," he said again. "We've got your WangNet, your NorthNet, your SouthNet, your EastNet, aaaaand your WestNet. Which shell is it under? Place your bets . . . you can't lose!"

"Bloatman! What's this all about?" I asked as a crowd began to gather. The gawkers all wore three-piece suits and stared like zombies at Bloatman's nimble shuffling of the pea.

"Network consulting," said Bloatman, trying to ignore me while speaking loudly to the crowd. "We've got the answer to your problems. We've got your token ring . . . an award winner, your token ring. Hasn't even shipped and it won Product of the Year. Itsa winner. Heya, heya, heya. We can install it in minutes." His hands moved quickly and the pea turned from blue to red to yellow.

"But there are no standards, no consistency with this stuff," I blurted out. "Shouldn't people just get the cheapest stopgap they can find?"

"Go away kid, you bother me," said Bloatman. He manipulated the pea, as observers began to reach into their pockets.

"Five will get you ten. Ten will get you twenty." Bloatman bent over and whispered in my ear. "Get lost, Dvorak. Haven't you heard the old saying 'Never give a user an even break'? Look, there's a user born every minute! Go away."

3COM MONTE He looked back up and smiled. "We've got your accountant's dream . . . we've got NetNet, we've got FilmFlamNet, ScamNet. You lookin' for cheap, we've got AppleNet, PhoneNet, FishNet. Put your money down. The game is called 3Com Monte. Just a joke, folks, to let you know that we have EtherNet too. We've got them all. We've got OmniNet, StarNet, SunNet, MoonNet, ButterflyNet. We've got products nobody ever heard of . . . yet! We've got LotusNet, MS-Net, Ashton-TateNet. Get 'em while they're hot."

One zombie turned to me and asked, "Who is this guy? He's great, huh!"

I turned to see a guy with a look on his face like he had just finished basic training at a Rajneesh camp. "That's the legendary William Bloatman, salesman of the century. They call him Buzz. He's always where the action is. He likes to say that the more confused and uncertain the market, the easier it is to reel 'em in."

The guy gave me a quizzical look. "Reel? I don't understand. All I know is that I'm going to buy one of these networks for my office. We need something." Robotlike, he reached for his checkbook. So did dozens of other mesmerized geeks. Bloatman was having a field day making everyone sign contracts. Satan could have been the contract writer, for all these jokers knew. Within a few minutes, everyone cleared out. Bloatman folded his blanket and was about to scram when he saw me.

"Still having papers, Dvorak? Sorry I couldn't talk to you earlier. You were cramping my style, kiddo. Lookit this!" He shook the pile of contracts in my face. "Hey, don't look so disgusted, Dvorak. Someday all this network garbage will be standardized and I'll be history. In the meantime, I'll get rich while these poor users try to make these things work. Hahaha. Here, read my book and learn something."

Bloatman reached into his vest pocket, pulled out a thin paperback, and handed it to me. As he walked off laughing, I looked it over. The book was entitled, *How to Win at Three-Card Monte and the Shell Game.* I opened the book, and inside it simply said: Be the dealer!

■ JOHN C. DVORAK

INSIDE TRACK

Price/performance and sluggish I/O are possible drags on the 386 chip's acceptance.

If there's a growing mania among the writers and pundits, it's over the use of the 80386 chip in the next generation of PCs. Everyone is wild about the chip. It breathes new life into the industry, they all say.

Let's review a few things about new technologies before we all cheerfully throw posies at this chip as if to welcome the dawn of a new age.

First of all, what does an 80386 machine offer us that we can't get from a much cheaper 80286 machine? Will it outperform a 24-MHz PC AT clone? Will the 80386 run important software that can't be handled by the 80286 machine? We come up empty on these issues.

So what does it do? Well, for one thing the 80386 can manage a terabyte, or something like that, of virtual memory, and it's internally a potential speed demon. But what good is all this memory-management capabilities and potential speed if the hard disk and all the peripherals are choked off by typical microcomputer I/O channels that are notoriously slow? It's like having a moped with an Allison V-16 engine. To take advantage of this chip you need channels that are many times faster than what we are using, and that costs big money.

Sure the 80386 machine may be the fastest *WordStar* engine you'll ever see, but so what? It will still be bogged down by the hard disk.

Try this. Use a machine with a super-fast hard disk and a 4.77-MHz 8088. Then use a machine with an 8-MHz 8088-2 and a slow hard disk. The machine with the fast hard disk will feel like the hot performer.

Let's look at some other aspects of the new 80386 machines. My concern is that

this chip is recently introduced and we don't know if there are any strange bugs in it. Most new technologies take a few iterations before they work right. Do you remember the IBM PC AT and all the little problems it had in the first months? It was ridiculed, sales were sluggish, the hard disk had a bad rap, et cetera.

If the 80386 machines follow the same pattern as the 80286 machines (and there is no reason to suspect they won't at these prices), then we can expect at least 1 year of sluggish sales, disappointment, and cynicism.

Acceptance Lags: I call this the Initial Acceptance Lag Phenomenon. It happens whenever there is a major change in design. It occurs because people hate to change habits. The only machine to even temporarily avoid the phenomenon was the Macintosh, which was hyped to death at intro. It's lag period came 6 months later, but came nonetheless.

This period, if not understood, can ruin the future acceptance of the product. It becomes jinxed as if cursed by a black-magic spell cast by an evil witch. Old Z-8000 products are a perfect example. The Intel 8085-based products fell prey to this phenomenon, too.

It may be an uphill fight. IBM can sit back and see the crowd's reaction to the first 80386 machines. If the company sees the lag phenomenon as a general trend rather than a phenomenon (which its current management is likely to do), it might decide to do something screwy such as ignore the chip altogether. Then the 80386 chip might become a white elephant roaming aimlessly with no standards, no direction. And let's not forget the rumors that IBM will try to submarine the 80386 with a fancy new operat-

ing system for the 80286 machines.

One light at the end of the tunnel (which hopefully isn't a train headed this way) is the commitment of Chips and Technologies to developing a VLSI chip set to support an IBM PC AT architecture that uses the 80386 chip. This will drastically bring down the price of an 80386.

We always have to remember that price/performance is the real issue in computing. Performance is more than a meaningless tally of instructions per second. A perfect example is the performance of a Z-80B when compared with a 4.77-MHz 8088. Before these two chips did battle, it looked like the Z-80B was the hotter chip. The ability of the 8088 to address scads more memory was an overlooked performance factor. So the 8088 won the chip battle.

Anyway, if the 80386 is to endure the lag phenomenon, it has to show a substantial price/performance increase.

Let's try to figure out what has to happen by looking at the AT. When it was introduced, the AT was reputed to be 200 to 300 percent faster than a PC-XT. It then cost $1,500 more than a comparable XT. That's between $500 and $750 per 100 percent increase.

The first 80386 machines claim the same 200 to 300 percent increase in power over the AT. Meanwhile, times have changed and we no longer calculate our price/performance values from the IBM price book but from the clone catalog. Now you can get an AT clone for less than $1,500. The 80386 machine should sell for $3,000, if we stick by the $500 to $750 per 100 percent increase model. It sells for between $6,500 and $8,000. This won't cut it if the Taiwanese have any say.

So the 386 AT will be a big winner if, and only if, the initial acceptance lag phenomenon is survived and the price drops drastically, soon. For now, it's just an expensive box that runs MS-DOS and Xenix. So what else is new? ▨

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"Individual users will nevertheless find it a delight—12MHz is a genuinely comfortable speed. In using the PC's Limited 286¹², I was never aware of waiting for the computer to catch up with me. Even overstuffed programs like Microsoft Windows and Word become limber at 12MHz. Running at 12MHz, the 286¹² seemed so natural as to be invisible. The computer became a perfect tool, one that you can forget and get on with the work you're supposed to be doing."

"The 286¹² is a well-designed machine that offers outstanding performance at a reasonable price."

■ PETER NORTON

COMPAQ'S BOLD STEP

The Deskpro 386 has speed; it has great disk size; its new tape backup unit is much improved. Compaq deserves applause, but Norton misses the excitement of yesteryear.

L
ife was a lot more exciting when we were children; it is a truism that the older we get, the more settled our lives get.

Certainly, the IBM PC's first couple of years were very, very exciting, largely because everything was all so new and so fast moving. Partly, too, it was because we didn't know how things were going to turn out with the PC. It was a lot like graduating from school: the future held all the possibilities, fresh and new, and there was very little history, commitment, or accomplishment to put any constraints on those possibilities.

By now, as we all know, the PC has a family and, it seems, mortgage payments to make as well. There's even child support to pay, in the form of the lingering consequences of the birth of the PCjr.

BIRTHDAY PARTIES Consider, if you will, two birthday celebrations that IBM held: one in the summer of 1984 for the PC's third anniversary and one this summer, in 1986, for the PC's fifth.

In 1984 IBM threw a big bash in Dallas, invited hundreds of key dealers and software developers, and unveiled two very major products: the AT, which raised the PC's speed and power by a factor of five, and *TopView*, a dramatic attempt to put a powerful windowing environment into the hands of PC users. Never mind that *Top-View* flopped; that can happen to any ambitious software product. The key thing is that IBM made a big attempt to bootstrap the PC into a much more powerful and easy-to-use operating environment.

That was a very big deal indeed, and it showed that IBM was working hard to move the PC forward with hot new hardware and a failed-but-noble effort at hot new software.

This summer IBM celebrated with a huge and lovely birthday card for the PC, which appeared as a thick advertising supplement in several prestigious magazines.

It was a great birthday card, but it didn't hold a candle to the birthday present that the IBM PC AT and *TopView* represented two years ago.

Proof indeed that the PC has settled down to being something of a dull, working, family man. (You can't knock the quality of the work the PC is doing or how much its family has benefited us all, but that has little to do with excitement.)

MUCH ADO ABOUT 386 Even the bit of excitement we expected this summer—the appearance of Compaq's Desk-

pro 386 machine—to me turned out to be a little dull).

By now you've seen all the hoopla about the Deskpro 386. There certainly is plenty to love about the machine, but the main thing that hits me about it is that it's a lot less exciting than the AT was when that machine appeared.

I have to admit that some of my lack of excitement over the Deskpro 386 is based on superficial considerations like look and touch—it's just the same old dull box, the same mushy keyboard (although now in IBM's new standard layout). Personal computers, in this regard, are like spouses: you don't choose 'em for their looks, but after all, if you're going to spend so much time with them, you'd rather have one that's attractive. There's a lot of good industrial design in the world, and more and more we're seeing PC clones with handsome designs. Compaq could respond that Tandy's are even uglier, but that's no excuse.

Thanks for a fast machine, Compaq, but what about beautifying America by putting good-looking machines on our desks?

NO NEW FEATURES Beyond that diatribe on bad styling (and, I repeat, bad keyboards), my main disappointment with the Deskpro 386 is that it has no new features to stir the blood.

Of course, the real excitement of the Deskpro 386—and other 386-based PCs—will have to wait for the soft-ware (DOS 5 or whatever) to turn on the machine's special potential. After all, 5

■ PETER NORTON

years ago the original PC was also waiting for software to bring it alive. Still, the lack of that software and the lack of any really special features built into the machine do make the Deskpro 386 unexciting for now.

On the other hand, who can knock raw speed? In my SysInfo computing-power test, the Deskpro 386 clocks in at about 15 seconds, two or three times the AT's speed. In all the tests that I and my gang

performed on the Deskpro 386, we found a pretty consistent two- or threefold improvement in speed, including such disk-intensive operations as compiles and spelling checks. That speed is certainly enjoyable, but you can also get it in a 16-MHz AT clone.

NICE TOUCHES They did plenty of things right on the Deskpro 386: like no longer bundling their dual-mode display with the machine (that's a *great* display adapter for a printer, but not for a desktop) and like having the right-size disk (I'm referring to the regular 40-megabyte disk, not that monster 130-meg disk, which is great but not needed by most of us). And especially like having the right-size tape backup.

I've always applauded Compaq for integrating tape drives into its Deskpro models. I think that tape backup is so important to the use of a hard disk that every machine should be equipped with one factory stock, and that's an option that Compaq has been offering. But, in truth, the tape drives Compaq offered just weren't up to the job. There were two things severely wrong with Compaq's built-in tape backup units.

One was the slow speed. In an era of reasonably priced streaming tape units that can back up 20 megs in under 5 minutes, there was little excuse for the quarter hour or more that a Compaq tape backup could take (not to mention the 40 minutes or so for formatting a tape). But it really doesn't matter how long a tape backup takes, as long as it can be done unattended, while you take your lunch or are in a meeting. The unforgivable sin of Compaq's old-model built-in tape drives is that they hold only 10 megs of data. Typically, that means you have to change tapes to back up all of your disk. Having two tapes to fiddle with is a minor nuisance; but having to change tapes during a slow backup means that you can't just go away for a while and come back to a completed backup. Ugh and triple ugh.

Thank heavens the new Deskpro 386 solves that problem. The new backup tape unit holds 40 megs, enough for a full disk (barring that 130-meg monster disk), and while it doesn't set any speed records, it will back up 40 in about the time the old one backed up 10. I still love streaming

■ PETER NORTON

tapes, and I'd still recommend, for most people, getting an external streamer for their backup, but Compaq's new tape is truly good enough to be usable, unlike the previous one. So cheers for that.

CAUTION TO THE WIND Probably the most remarkable aspect of the Deskpro 386 is that it represents a much more daring move by Compaq than it has made in the past, and it certainly deserves applause for that. Compaq's genius has always been incredibly good judgment on how to innovate cautiously. Each Deskpro model has added just enough new value to significantly improve on what IBM offered but always so little extra that the machines were never seen by the (often timid) buying public as being too far off the main trunk of the PC family tree.

Having come out with that kind of cautious innovation with great success time after time, Compaq was ready to do something a little more daring—bring out a 386 machine without waiting for IBM to set the "standard." (IBM is not as fully in a position to set standards as it used to be.)

Compaq's risk is that its Deskpro 386 could become an oddball or nonstandard variation on the PC family's 386 branch. Certainly we have a serious risk of ending up with at least three variations on 386s—Compaq's design, the Phoenix-led independent standard design, and whatever shape IBM's design takes.

Although there are many factors that make a machine "standard" or "nonstandard," one of the most important factors is the bus design, and the expansion slots that connect add-on boards to that bus. Since the 32-bit buses that 386 machines use are new (the PC used 8-bit, the AT 16 and 8-bit), there's some debate over what they should be like. Compaq cleverly ducked the question by restricting their 32-bit bus to one slot, dedicated to the machine's memory. All the open slots are standard PC and AT slots.

But the simple reality is that because Compaq is already a very major PC maker and because its 386 is the first important one out of the chute, Compaq's design becomes, de facto, an industry standard. And that will be reinforced, I'm convinced, when Compaq sells the lowest-possible price

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■ JIM SEYMOUR

STANDARDS VERSUS INNOVATION

The advent of the 80386-based PCs has renewed industry preoccupation with standards setting. How will this affect (and permanently change) the idea of the "IBM PC standard"?

There's a lot of talk in the personal computer world these days about standards. That's funny in a sense, because it's hard to talk with a straight face about "standards" in a business that has fallen in love with so many conflicting standards.

Standards setting in the PC industry has traditionally followed the Old MacDonald model: here a standard, there a standard, everywhere a standard, standard. Largely ignored, and thus not really a standard after all.

Yet with the advent of the 80386-based PCs, we're going through this whole paroxysm of standards setting—or at least standards debating—once again.

SHATTERED STANDARD My guess is that the ultimate outcome of the appearance of the early 386s is that we're going to see a profound and permanent shattering of the idea of the "IBM PC standard" as a singular, specific thing. No matter what IBM Corp. does to make its 386s proprietary, other "386 standards" from other vendors are going to appear, and many will be viable machines (I resist the word *standards*), with long, useful lives.

Compaq's new 386 is just the start of a series of PCs that will deliver a lot of value to their users but aren't necessarily either imitative or predictive of what IBM will do—or of *how* Blue will do it. (See my story, "Compaq Becomes a Technology Leader," in this issue for more on Compaq's standards-setting role.)

That fractured standard will come to include a number of machines of different design, linked together by their ability to run DOS programs.

But unlike present-day "compatibles," these PCs will approach the task of running DOS applications from new perspectives. A workable VM/386 operating system (which creates multiple "virtual machines" within a single 386 box, with each virtual PC able to run separate and concurrent DOS applications) is the key here. And such an operating system is coming, near the end of the year.

It doesn't much matter, of course, how proprietary IBM manages to make its 386 or its operating system, nor whether it chooses to bury part of that operating-system code in silicon.

As long as you and I can run present and future DOS applications on machines like the Compaq 386, including using more than 640K bytes per application when necessary, the fact that IBM's 386 delivers those same applications to us via a different path is irrelevant.

APPLICATIONS WORLD This isn't a hardware world; it's an applications world. People don't buy PCs to study the ROM BIOS; they buy them to run *1-2-3* and *WordStar* and *R:base* and other such useful tools.

IBM, of course, created this fractured-standard opportunity by delaying introduction of an IBM 386 PC to defend the System 36, RT PC, and other high-end machines.

Which is unsurprising, given how much IBM has to defend and how conservatively it manages the introduction of new technology. But if you think I'm about to flay IBM on moral grounds for holding back the personal computer industry through failure to advance the "standard" with an early, innovative 386, you're wrong.

In IBM's position, many of us might have made the same decisions. IBM's in the business of making money, not computer evangelism. Its responsibilities are to its customers, its employees, and its stockholders.

When IBM's managers see a new technological initiative threatening Fort Armonk's revenue streams from existing products, the reaction is predictably and defensibly to protect those existing product lines.

But someone once said the key to leadership in technology industries is the courage to make yourself obsolete, over and over again. It's a good line, and I think

Illustration: Steve Cieslaw

NOW. POWERFUL WITHOUT POWE

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(4) File Processing
(5) Exit

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■ JIM SEYMOUR

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■ JIM SEYMOUR

STANDARDS VERSUS INNOVATION

The advent of the 80386-based PCs has renewed industry preoccupation with standards setting. How will this affect (and permanently change) the idea of the "IBM PC standard"?

There's a lot of talk in the personal computer world these days about standards. That's funny in a sense, because it's hard to talk with a straight face about "standards" in a business that has fallen in love with so many conflicting standards.

Standards setting in the PC industry has traditionally followed the Old MacDonald model: here a standard, there a standard, everywhere a standard, standard. Largely ignored, and thus not really a standard after all.

Yet with the advent of the 80386-based PCs, we're going through this whole paroxysm of standards setting—or at least standards debating—once again.

SHATTERED STANDARD My guess is that the ultimate outcome of the appearance of the early 386s is that we're going to see a profound and permanent shattering of the idea of the "IBM PC standard" as a singular, specific thing. No matter what IBM Corp. does to make its 386s proprietary, other "386 standards" from other vendors are going to appear, and many will be viable machines (I resist the word *standards*), with long, useful lives.

Compaq's new 386 is just the start of a series of PCs that will deliver a lot of value to their users but aren't necessarily either intuitive or predictive of what IBM will do—or of *how* Blue will do it. (See my story, "Compaq Becomes a Technology Leader," in this issue for more on Compaq's standards-setting role.)

That fractured standard will come to include a number of machines of different design, knitted together by their ability to run DOS programs.

A workable VM/386 operating system (which creates multiple "virtual machines" within a single 386 box, with each virtual PC able to run separate and concurrent DOS applications) is the key here. And such an operating system is coming, from several manufacturers, around the end of the year.

It doesn't much matter, of course, how proprietary IBM manages to make its 386 or its operating system, nor whether it chooses to bury part of that operating-system code in silicon.

As long as you and I can run present and future DOS applications on machines like the Compaq 386, including using more than 640K bytes per application when necessary, the fact that IBM's 386 delivers

those same applications to us via a different path is irrelevant.

APPLICATIONS WORLD This isn't a hardware world; it's an applications world. People don't buy PCs to study the ROM BIOS; they buy them to run *1-2-3* and *WordStar* and *R:base* and other such useful tools.

IBM, of course, created this fractured-standard opportunity by delaying introduction of an IBM 386 PC to defend the System 36, RT PC, and other high-end machines.

Which is unsurprising, given how much IBM has to defend and how conservatively it manages the introduction of new technology. But if you think I'm about to flay IBM on moral grounds for holding back the personal computer industry through failure to advance the "standard" with an early, innovative 386, you're wrong.

In IBM's position, many of us might have made the same decisions. IBM's in the business of making money, not computer evangelism. Its responsibilities are to its customers, its employees, and its stockholders.

When IBM's managers see a new technological initiative threatening Fort Armonk's revenue streams from existing products, the reaction is predictably and defensibly to protect those existing product lines.

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■ STEPHEN MANES

YOU GET WHAT YOU PAY FOR?

SquishySoft, maker of that world-renowned software program MaxiTool, wants your help (as a famous software expert) in debugging Release 2.0. What? You think you should get paid?

You are working feverishly to finish a project due yesterday when you detect Interrupt 1H: the jangling phone.

"This is Dulcie Greenblatt from SquishySoft," gurgles a California voice full of sultry breezes. "Assistant product manager for *MaxiTool*? How are you today?"

"Busier than a queen bee in heat," you jape.

"Well, I won't take up too much of your time?" says Ms. Greenblatt.

"Impossible," you mutter.

"We consider you one of the nation's leading experts on our *MaxiTool* software?"

You emit a mild snort. As far as you're concerned, you're *the* leading *MaxiTool* expert. You've written a score of articles about it. "In fact, it's on my screen even as we speak," you reply. "A fine program. Though not without its shortcomings."

"Groovy? Far out? We want you to tell us just what you want to see in Version 2.0 of the product?"

You sigh. "That would take 2 days."

"Maybe you could send us a report?"

You quote your standard fee.

The phone emits a gasp. "You mean you would charge us?"

"I'm not an eleemosynar."

Ms. Greenblatt does not say "Huh?" She says, "No one else we've contacted wants to charge us."

"Perhaps no one else you've contacted has been worth much."

"Well, we would really like your input? I'll get back to you? Soon?"

Three days later Interrupt 1H disturbs your midday siesta. It's James "Jim" Morrison, the *MaxiTool* product manager. "Our corporate policy has existed since back when we were known as LightMy-FireSoft," he explains. "We just don't have a budget for paying outside consultants in this phase of development. It's standard industry practice."

This, you are aware, is all too true. Software and hardware companies will spend their shekels on imbecilic focus groups and head-nodding marketing consultants, but never for outside advice on software design. After all, they're supposed to be the experts.

"There are many quaint industry practices with which I am not in wholehearted accord," you reply sadly. "Alas, I don't have a budget for doing other people's work gratis."

"A shame," says he. "We would really like your input."

ALPHA TEST Six months later you are working on a project that's due the day before yesterday. Interrupt 1H again. "Dulcie Greenblatt, new product manager for *MaxiTool*? How are you today?"

"Worse."

"We're about to begin alpha testing for our new Release 2.0? We'd like you to visit our headquarters next Monday and Tuesday and tell us how you feel about the product?"

"Does this mean you are ready to part with my fee?"

"We'll cover all your travel expenses, including transportation, meals, lodging, and two glasses of wine each evening?"

"Quite possibly we have a bad connection. I heard nothing about my fee."

"It's not our policy to pay outside alpha testers?"

"It's not my policy to spend two dark days in someone's smoke-filled offices without adequate remuneration?"

"You'd be one of a select few to preview this product months ahead of schedule? Other experts like yourself have already agreed to attend?"

"Perhaps they were born with proverbial silver spoons. Perhaps spending 12 hours on airplanes and then sitting around a corporate headquarters is their idea of a swell vacation. Perhaps they are susceptible to flattery. Say hi to them for me."

BETA TEST Three months later you get a letter from Dulcie Greenblatt, vice president and director of product management at SquishySoft. It informs you, Dear Expert User, that you have been selected as a

■ **STEPHEN MANES**

potential beta-test site for a new Squishy-Soft product. All you have to do is return the Application Form, the Beta Test Non-Disclosure Agreement, and the 400-question User Profile Questionnaire. If you are among the chosen, you will receive a copy of the package within 30 days.

The letter warns that "Beta Testers must commit the time necessary to learn a new product and fully document their in-

teractions with it" and that "You will be working with new prerelease programs that are not yet perfect; your input is needed to finalize them. SquishySoft may interview you at the close of the beta-test period." For all this "you will receive one complimentary copy of the product you tested when and if such product is actually released."

Two weeks later, Interrupt 1H is followed by the voice of Irwin Muggleston, executive assistant to Dulcie Greenblatt. "Have you received our Beta Test Application yet?" he wonders.

"I have disposed of it safely and properly," you reply.

"We were hoping that you would join our team," says Mr. Muggleston. "We really would like your input."

"I really would like to give it to you," you reply. "However, I really do not enjoy futzing around with bug-ridden early versions of software that have the potential to destroy my work. Nor do I really derive great pleasure from maintaining an endless bug log. And I really do not consider a copy of a program I can borrow from a friend or actually buy mail order for the munificent sum of 200 bucks entirely adequate compensation."

RELEASE 2.0 Three months later, with a great deal of fanfare, Release 2.0 of *MaxiTool* is brought to market. When you discover it is largely incompatible with the first version, jettisons many of that version's most useful features, runs only half as fast, will not work with a monochrome monitor, has a marked propensity to trash files and disks, and costs three times as much as the original version, you write a nasty review in a major publication.

The day after it hits the stands, you respond to Interrupt 1H. You have to; it's nonmaskable. D. Greenblatt, president and chief executive officer of SquishySoft, is in high dudgeon. "How dare you attack our product! You could have found those problems when we came to you! You refused to help us! We really wanted your input!"

You just shake your head as her tirade continues, "And you actually have the gall to criticize our new slogan! Honestly, just what do you think is so terrible about 'You Get What You Pay For,' anyway?"

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■ STEWART ALSOP

WHAT'S ON STEVEN JOBS'S MIND?

Steven Jobs's newest computer project may lead the way into a future based on high-speed graphics and connectivity. The hardware for it already exists.

Whatever you may think of the Macintosh, Apple Computer, or its cofounders, I think you would agree that Steve Jobs has accomplished quite a lot in the past 10 years. It's not hard to say that Jobs is a man of vision, since he's had a hand in designing and promoting two popular computers (the Apple II and the Macintosh). So it almost goes without saying that people in the industry are wondering what he's up to with his new company, Next Inc. What vision is the guy working on now, people ask, or is he burned out?

For the first time since he left Apple last year, Jobs spoke in public at the recent Seybold Conference on Desktop Publishing in San Francisco. What he said gave a hint of a completely different and very exciting way of thinking about computers as communications tools (and perhaps a peek at the features of whatever computer Next is designing).

What Jobs said was that desktop publishing software is the precursor to the way computers will operate in the future, that in 5 years every computer will incorporate desktop publishing software, meaning the ability to format and compose documents graphically. Most people reacted to Jobs's speech by saying that he was just doing his usual quotable shtick. So did I—until I thought about what he was saying.

WHAT'S NEXT Forget about how you use a computer now. Just put it out of your mind. Instead, think of using a computer with the following basic features: a 32-bit processor running at 24 MHz; 8 megabytes

of memory; one 1.6-megabyte, 3½-inch floppy disk; a 60-megabyte hard disk; a 960-line by 1,280-pixel resolution display powered by a dedicated graphics coprocessor; a mouse; a built-in, 9,600-bit-per-second modem with an integrated facsimile device; and Version 3.0 of *Microsoft Windows* plus Version 7.0 of DOS in ROM. This is a basic model that sells for $3,500.

What's most interesting is to think of how you might use this computer. When you write documents or work on spreadsheets or manage your database, you can easily and quickly format the data in a range of fonts and styles and enhance it with graphics or pictures that have either been scanned in through a 400-dot-per-inch scanner on your network or created in a drawing or painting program on your 400-dpi² monochrome screen. When your document is ready, you can print it out on the 400-dpi laser printer on your network and show it to somebody else. Or you can

send it by your built-in facsimile device to another office's facsimile (which has a 400-dpi laser printer built in) or to someone else who has the same kind of computer. Electronic mail, in other words, changes from being a messaging system to being a binary file transfer system that lets you send reports, invoices, purchase orders, newsletters, or any other document, as well as memos. That's what Jobs meant by saying desktop publishing would be integrated into the computer.

ALREADY HERE Every piece of the system I described above is existing technology. Thirty-two-bit processors, such as the Intel 80386 and Motorola 68020, are used in machines you can buy today, though the 24-MHz versions aren't in production yet. You can buy 8 megabytes of RAM, although it won't do you much good until the new DOS 5.0 becomes available early next year.

The 1.6-megabyte floppy disk will be on the market when somebody figures out how to make a 3½-inch drive that reads a quad-density format. Hard disks already exceed 60 megabytes. They're large and pricey, but computer technology always gets smaller and cheaper. Displays with that kind of resolution are already on the market, and virtually every video-controller company is working on a board that will use one of the Intel or Texas Instruments graphics coprocessors to control the screen.

A company called Telebit already sells 9,600-bit-per-second modems, and another company called Gammalink sells a board that integrates a text-only, one-way

■ STEWART ALSOP

facsimile device into a PC. Facsimile devices already are capable of scanning and printing at 200 dpi (the so-called Group III standard), and the Group IV standard for a 400-dpi facsimile is being developed now.

By the time all the other parts are ready, IBM and Microsoft will think that their operating system and environment are bug free enough to commit to ROM.

One of the key developments that must

happen is for input, display, and output devices to settle on a common way of describing documents in a common resolution. Laser printers already have one standard way of describing pages, namely PostScript, which is built into the Apple LaserWriter and forthcoming printers from DEC, Wang, Texas Instruments, and other major companies (except Hewlett-Packard and Xerox).

PostScript can also be used to describe the screen for a monochrome display and can be built into facsimile printing devices. As far as I know, it can also be used to scan documents into a computer or facsimile device in a sort of "page-undescription." And all of these technologies need to be able to display images at 400 dpi, so that what you format on the screen matches ex-

■ The future of computers has nothing to do with technology but everything to do with computer industry politics.

actly what you scanned, printed out, or sent to a facsimile device.

REGRESSIVE POLITICS The reason that this vision of the future of computers—easy to use, highly integrated, enormously powerful—probably won't happen, at least in the next 5 years, has absolutely nothing to do with technology. It has everything to do with the intramural politics of the computer industry.

Computer companies believe it is necessary to compete by having different technologies, so they have never been able to adopt the kind of standards that would make this level of computing possible. Jobs even called Hewlett-Packard "brain-damaged" for failing to adopt PostScript as the standard language for its laser printers. Ironically, Steve Jobs has probably introduced more nonstandard computer products than any single person in the industry.

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AMT's compact Lap Top system gives you full IBM compatibility in less than 12.2 pounds of high-powered computer.

Features an 80C86 microprocessor giving you twice the speed of IBM's lap top; 640 KB of memory; two 720 KB, 3.5-inch disk drives; an 80-by-25 LCD display with 640 x 200 resolution; RGB and printer ports; and a 1200 baud internal modem, optional.

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AMT's top-of-the-line AT system outperforms the IBM PC AT® at a fraction of the price. Tagged "Best Priced" by PC Week, March 1986 issue.

Our phenomenal AT has a 16-bit Intel 80286 CPU running at 8 MHz (10 MHz or 12 MHz optional); 640 KB of RAM, expandable to 1 MB; 1.2 MB floppy disk drive; accommodations for 20, 30, or 40 MB hard drive; a socket for an Intel 80287 math co-processor; and a "0" wait state on memory, optional.

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The Token-Ring LAN is a reality. It shouldn't surprise you that IBM[*] was the company that developed it. It should be equally unsurprising that the technology that best allows the Token-Ring to communicate with the mainframe comes from DCA, the makers of IRMA.[*]

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To find out more about DCA's IRMALAN, call us today at 1-800-241-IRMA, ext. 518.

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COMPAQ LEADS THE WAY TO SPEED AND COMPATIBILITY

Compaq's new Deskpro 386 establishes a new order for personal computers, with twice the speed of the PC AT and the Compaq machines' characteristic compatibility.

C lass, today's quiz is on the fastest-rising company in Fortune 500 history and its newest product. Take out your No. 2 pencils, don't make marks in the margins, and no looking at your neighbors' papers.

1. The Compaq Deskpro 386 is:
   A. The ultimate turbo AT.
   B. The future of personal computing.
   C. The first machine to make *Microsoft Windows* run right.

2. The Deskpro 386 operates under:
   A. DOS 3.1.
   B. Xenix.
   C. DOS 5, if there ever is a DOS 5.

3. The difference between a minicomputer and a 386-based PC is:
   A. Mostly a matter of how you use the machine.
   B. Not enough if you're product manager for the System/36.
   C. At least ten grand.

4. How's IBM going to take this?
   A. Not very well.
   B. "It is not our policy to comment on products that may or may not be under development."
   C. "IBM extends warmest best wishes to its colleagues and believes there's more than enough market share to go around for everyone."

Now that we've collected the papers, we can tell you that the answer is All of the Above except 4C. If you chose C for question 4, we'd like to suggest paying more attention in Current Events class.

PLUS ÇA CHANGE Ever wonder if the horse felt threatened the first time he looked over his shoulder and saw Henry Ford's contraption rattling up behind? In the case of Compaq Computer Corp.'s new 80386-based Deskpro 386, there's al-

most nothing about the way the machine looks that suggests its magnificent abilities or the difference between the new order and the old.

On the outside, the Deskpro 386 resembles the Deskpro 286 gussied up with a wider keyboard. Inside, the layout is also similar: two drive bays right front, power supply right rear, four 16-bit expansion slots, and three 8-bit slots that accept industry-standard peripherals.

However, the processor chip looks a bit larger than the 80286, and there's no memory on the motherboard; it's on an expansion slot with a nonstandard connector.

16-MHz 80386 The heart of the machine is a 16-MHz Intel 80386, a full 32-bit microprocessor—unlike the Motorola 68000 driving Apple's Macintosh, a hybrid 16/32-bit CPU—that can emulate the PC's 8086/8088 and the AT's 80286. The

Compaq Enhanced Keyboard   32-bit System Memory Board

Compaq Color Monitor   32-bit Memory Expansion Board

PARTS DEPARTMENT

Compaq has surrounded Intel's state-of-the-art 80386 chip with its own state-of-the-art components. The Compaq Color Monitor (upper right), along with the Compaq Enhanced Color/Graphics Board, is compatible with software designed for the IBM EGA standard. The 13-inch nonglare screen can display 16 colors at a time with a resolution of 640 dots by 350 lines. The monitor also has a built-in tilt bar that adjusts it to proper eye level. The Compaq Enhanced Keyboard (upper left), which includes separate numeric and cursor control clusters and extra function keys, follows the 101-key configuration that is becoming the new standard for PC workstations. The first full slot on the motherboard is occupied by the 32-bit System Memory Board (lower left), which supplies 1 megabyte of RAM. And in order to avoid those annoying "Memory full" messages that sometimes pop up during the

manipulation of large amounts of data—a task the Deskpro 386 is specifically designed to do—Compaq sells two different 32-bit Memory Expansion Boards (lower right). The 1- to 2-megabyte board (which includes 1 megabyte of RAM) is arrayed with 256K-byte RAM chips and costs $849, while the 4- to 8-megabyte board (which includes 4 megabytes of RAM) carries 1-megabyte chips and sells for $2,999.

PC AT emulation will be important to people who first buy the Deskpro 386 because it allows existing PC applications to run both without modification and faster, since the 80386 runs at twice the speed of an 8-MHz 80286. There will be a still-more-dramatic speed improvement when applications and operating systems use the 32-bit operating mode.

Be prepared to pay twice for this speed: once for the machine ($6,499 with a 40-megabyte hard disk, $8,799 with a 130-megabyte hard disk, plus monitor—about 20 percent more than an AT). More than a

few software publishers may treat 32-bit versions of their software as new products, not $75 upgrades. But the speed will be worth it. Comparing its Deskpro 386 with an AT, Compaq says it's two to three times as fast (the PC Magazine Labs benchmark tests confirmed it at least twice as fast as a PC AT) and as much as ten times as fast with 32-bit software.

Here's another tantalizing example: filling, manipulating, and recalculating a large *1-2-3* spreadsheet—a standard PC Labs benchmark test—takes 4 minutes, 13 seconds on a stock PC. A PC AT can do the

same task in 98 seconds. The Deskpro 386, with a $349, 8-MHz 80287 math coprocessor installed (Intel hasn't come out with an 80387 yet), buzzed through the spreadsheet in 24 seconds. Now just imagine the Deskpro 386 running with Lotus's *4-5-6* running under DOS *5.x*.

RAM-FREE MOTHERBOARD Unlike most PC motherboards, the Compaq unit contains only the processor, system ROMs, and support circuitry. All RAM is contained in a special card that plugs into the one and only proprietary 32-bit bus

AT-COMPATIBLE
8- AND 16-BIT BUS

ROM BIOS

INTERRUPT AND
DMA SUPPORT

80287 MATH
COPROCESSOR

INTEL 80386
MICROPROCESSOR

32-BIT
MEMORY BUS

connector, in slot 1 (the left-most slot). The memory card comes with 1 megabyte of static-column RAM, expandable to 2 megabytes, using 256K-bit RAMs. An additional piggyback board can be included with either 1, 2, 4, or 8 megabytes of RAM. The 4- and 8-megabyte configurations use 1-megabit RAM chips. Even with 10 megabytes on one card, the memory takes up only a single slot.

If you absolutely must have more RAM (at some point, with multiple programs running concurrently, 10 megabytes could be limiting), another 4 megabytes could be inserted into a 16-bit expansion slot, with a commensurate loss of speed. Left on for several hours a day, a PC with 14 megabytes of RAM should adequately heat a small home.

Peripheral support, including all disk and tape support, resides on a single 16-bit expansion slot. A second, 8-bit slot is nor-

mally used by the video adapter, leaving free three 16-bit slots, one 8-bit slot, and one half-length 8-bit slot. The 8- and 16-bit bus cards run at 8 MHz. That's the same as the new IBM PC AT, so most add-on cards should work. Only the 32-bit memory bus runs at 16 MHz.

Compaq also paid attention to the other parts of the system. Two hard disk systems are available, Model 40 and Model 130, with a 40-megabyte half-height and 130-megabyte full-height disk drive, respectively. Both have a faster track-to-track access time than previous Deskpro models, which never fast to begin with. Compaq claims no worse than 30 milliseconds average access time for the 40-megabyte disk drive, 25 milliseconds for the 130-megabyte disk drive. On the widely used Core International Disk Access benchmark test, the smaller drive registered a 20-millisecond access time.

A half-height, 40-megabyte tape backup unit has twice the transfer speed and four times the capacity of the DC-1000 options on previous Deskpro units.

Both Deskpro models come with a 1.2-megabyte floppy disk drive. You can install a total of four half-height devices in

the Model 40, or two half-heights and the big Winchester in the Model 130.

FASTER EGA The only speed-critical area other than RAM is the display adapter. Here, Compaq offers a $599 EGA card based on the Chips and Technologies EGA CHIPSet. Compaq had planned to include Microsoft's new InPort Mouse Connector on its EGA card, but problems with FCC certification forced its removal shortly before production began. The full-length board has additional circuitry to support the Compaq dual-mode, amber-screen monochrome monitor. For people who want an all-Compaq computing solution, there's a made-for-Compaq (by Mitsubishi) $799 EGA color monitor.

While you can find Chips and Technologies-based EGA cards for under $300 on the street, if you want video speed, stick with the Compaq brand. Using a relatively simple trick that works only with the Compaq EGA, the engineering team, led by Compaq vice president Gary Stimac, slipped the EGA a fistful of amphetamines. How? Compaq reserves 128K bytes of RAM in the top part of the first megabyte of RAM (the area after the 640K bytes of user memory). This space is used

uses the floating-point library included with Microsoft C Compiler 3.0.

The Disk Access benchmark test, from Core International, measures the hard disk's seek time, or how fast the drive responds to the disk controller's instructions. The test program performs three measurements on the speed at which the drive head moves: track to adjacent track, track to randomly selected track, and the average of a series of random track accesses. Only those results for a series of random track accesses are shown here.

Relative Times
(Ratio: 8-MHz IBM PC XT = 100)

IBM PC XT	
8-MHz IBM PC AT	
16-MHz PC's Limited AT	
Compaq Deskpro 386	
Access 386	

Disk Access (Random)

Floating-Point Calculation

NOP

to keep a copy of the EGA ROM BIOS that supports the EGA.

Access to the EGA using the RAM-based BIOS is faster because the copy resides in 32-bit memory, which runs twice as fast as memory that is located on the 8- or 16-bit bus. Some video operations can be up to twice as fast.

In theory, a 32-bit version of the EGA and support programs would run even faster, but Compaq believes the next generation of video adapters will be based on coprocessor chips like those available from Intel and Texas Instruments. In that case, the speed of the interface bus is less critical because the coprocessors handle most operations on resident graphics memory, and the 16-bit AT-compatible bus is more than sufficient for this.

Incidentally, the Compaq EGA can drive the dual-mode monitors in Compaq's portables, too. Imagine a 286-based Compaq Portable II with an EGA color monitor!

The keyboard emulates the 101-key keyboard introduced in early 1986 with IBM's RT PC and now offered with IBM ATs and XTs, too. Twelve function keys run along the top, and the cursor control and numeric keypads have been separated.

Even the keyboard cable connector is the same as IBM's. As with all Deskpros before, the keyboard is both quieter and softer than the clicky IBM keyboards.

SPEED CONTROL Speed is the most interesting aspect of the new Compaq, but Compaq is also known for compatibility. This machine is no exception. The 80386 was the first step, and the conventional peripheral interface is relatively straightforward. However, there are two types of programs that usually plague faster machines: communications programs and copy-protected programs.

Communications programs that are processor-timing-dependent will often not work on a faster machine. These tend to be disappearing because the proper techniques to handle such problems.

Copy-protected programs are a bit more difficult. Although copy protection is on the way out, some applications use timing that is dependent on disk access times. Compaq's solution: detect when a program is using this technique and slow down the 80386 during disk access. Detection is based on ROM BIOS disk-access functions. The 80386 is slowed by increas-

ing the time associated with refreshing the dynamic RAM. This is more efficient than adding wait states to 80386 memory operations. The delay can be turned off, set specifically, or set automatically.

The last addition to the system is a piece of software that allows the machine to use extended memory to support the Lotus/Intel/Microsoft expanded memory specification. On a PC, XT, or AT, EMS support is normally provided by an add-on RAM card, such as Intel's Above Board/AT. Compaq's software emulation uses the 32-bit RAM, which is faster than an add-on board. It does this by using the Virtual 86 mode supported by the 80386. The Virtual 86 mode is used to take advantage of the page-mapping facility of the 80386 because the mapping cannot be done in the normal 8086 mode. There's minor speed degradation, but the emulation facility need be used only when EMS support is required. Like the copy-protection support facility, EMS support can be turned on and off automatically, as necessary.

While most industry seers believe that EMS is a temporary measure, Compaq expects it to be a more enduring standard that extends the life cycle of today's software onto tomorrow's PCs.

386 COMPATIBILITY: WHAT, ME WORRY?

If IBM's eventual 80386 PC spites the early-bird 386 community with incompatible technology, Big Blue cuts off millions of PC, XT, and AT users, too.

The nightmare wakes you in a cold sweat. You bought a PC AT the first month it was available in 1984. Long ago you outstripped the power of your current 8-MHz PC AT. Now you buy one of the first Compaq Deskpro 386s, and a week later IBM recodes its BIOS, goes to a 32-bit expansion bus, changes the location of the Esc and Ctrl keys once again—and your Deskpro 386 goes from a state-of-the-art PC-compatible computer to a state-of-disbelief PC-incompatible paperweight.

Could IBM be so cruel? You bet. Will IBM be so cruel? It's possible, but perhaps not that likely. An old Sicilian proverb suggests IBM's predicament: when you set out on revenge, first dig two graves—one for your victim and one for yourself.

In plain English, most, if not all, of the changes IBM could make to a PC AT 386 that would render incompatible the 386 machines or the competition would do the same to the 5 to 7 million MS-DOS PC- and AT-caliber machines. And several million of those are IBM PCs, XTs, and ATs. In sticking it to the competition, IBM would be doing the same to its own people. There's a fine line between being insensitive and being dumb that Big Blue would be loath to cross.

IBM set the PC standard in 1981 and expanded it with the PC-XT (1983) and PC AT (1984). Can IBM set a second PC-based standard? Compaq's bet is that IBM can't and *probably* won't try.

"SAFE MOVE" When *PC Magazine* spent a humid summer day in Houston with Compaq executives getting an advance look at the Deskpro 386, the conversation was nearly as much about the IBM mind-set as it was about Compaq technology. Most of the qualms you have about Compaq jumping out ahead of IBM Compaq has had, too. Compaq's

conclusion: IBM's DOS standard is now bigger than IBM. In 1981 IBM had several hundred thousand CP/M, Apple, and TRS-DOS machines to elbow aside. Now it has more than 5 million.

"How we convinced ourselves the 386 was a safe move was to go down a list of all the alternatives," says Compaq president Rod Canion. "Today, every path you go down, there's a standard already."

Here's how Compaq views the compatibility issue. While it's obviously self-serving, it's also well thought out.

■ Operating system. "The operating system is not a 386 issue," says Canion. "It's an IBM-versus-the-industry issue. IBM is probably figuring a way to make its operating system proprietary. But if IBM can figure a way to do this, it can do it on the 286 just as easily as on the 386.

"Just wanting to do it isn't enough to make it successful. *TopView* is an example of what can be viewed as a proprietary operating system that failed because it wasn't needed in the first place. The job IBM has of finding a proprietary operating system that really will cut off the rest of the industry is difficult or impossible."

■ Display. It's the same situation as for the operating system. Build a new display adapter into the IBM 386 that won't run the existing monochrome/color/enhanced-color standards, and you build in incompatibility. Displays that now use the 8-bit bus (all current IBM displays) would gain speed on a 16- or 32-bit bus, but not nearly as much as through the use of a dedicated graphics coprocessor (that would put fewer, not more, demands on the 386). If a new IBM display becomes a standard, it can be emulated.

■ Serial, parallel, and communications I/O. The 8-bit PC expansion bus is an established standard for these peripherals. Speed is limited by the peripherals

(modems and printers) rather than the width of the bus. (Fast laser printers might benefit from 16-bit AT-style expansion slots and dedicated controllers.)

■ Floppy/hard disk drives and tape backup. Floppy disk drives and tape backup are adequately served by existing 8-bit slots, hard disks by 16-bit slots.

■ 32-bit port. "[Except for memory,] it didn't offer anything that was needed," Canion says. "If you're going to do a minicomputer (and that may be the path IBM takes), you do need a 32-bit port. But in a desktop workstation, we saw no justification for a 32-bit port—and certainly no reason to try to push a standard on the industry when it wasn't ready.

"Theoretically," adds Canion, "IBM could come out with it as an advantage. If it is and an industry standard is set, then we'll provide it."

So why not beat IBM to the punch with more than the single 32-bit Compaq expansion slot (dedicated to the RAM card)? Says Canion: "When IBM has one 32-bit port—if IBM has one—it won't be like anything we would have done or anybody else would have done."

JURY'S OUT Second-guessing IBM is a risky business. But Compaq grew to Fortune 500 size in less than 5 years by not building anything stupid or out of the mainstream. Compaq hasn't, for instance, opted to build a better mainframe than IBM or challenged IBM's minicomputers (Digital Equipment Corp. does that handily already). And IBM has suffered far more losers than Compaq.

At the very worst: if IBM goes its own way on compatibility and if the IBM 386 is more popular than the machines from Compaq and a growing list of other makers, you'll be left with both a fast Xenix machine and an ultrafast 386-based AT—and you'll have 5 million-plus PCs on your side.—**Bill Howard**

WHAT KIND OF RAM?

Five kinds of memory configurations—and which ones to use with the new 80386 microprocessor.

The new 80386 can access memory twice as fast as the 80286, which is much faster than the memory itself can process requests. Since fast memory costs a lot, typically the processor is made to wait while slower memory is being used. Other kinds of memory reach a compromise between the two.

According to Gary Stimac of Compaq Computer Corp., Compaq considered five memory configurations for its new 80386 microcomputer before it chose static-column RAM: static RAM, cache memory, paged memory, static-column RAM, and dynamic RAM.

Static RAM is the fastest but costs eight times as much as dynamic RAM. Unlike dynamic RAM, it does not require refresh overhead and uses the least amount of support circuitry.

Cache memory is a combination of two banks of static RAM, one bank of dynamic RAM, and some complex support circuitry. One bank of static RAM is used to keep a copy of the data in the dynamic RAM, while the other bank is used to keep cross-reference information about the other static RAM.

RAM ACCESS Accessing this RAM is a multistep process. First, an address, which calls up the address in the cross-reference RAM, is presented to the support circuitry. A match, called a *hit*, indicates that the data is contained in static RAM and is available immediately. A *miss* means that the data is in dynamic RAM and that, in order to be accessed, it must be copied into the faster static RAM. Various algorithms have been developed to determine how this new data is to be placed into static RAM and what is to be displaced.

The access time of the system is based upon the "hit rate," which is designed to be greater than 95 percent, as well as the speed of both the static and dynamic RAM. The system must use fast static

RAM because, in addition to reading from the two static RAM banks, it must perform the comparison and switching operations. Because of the overhead these operations require, the speed result from very fast static RAM is the same as the result from static RAM alone.

Static RAM cache sizes tend to be 4K, 16K, and 64K bytes and larger, especially on superminis and mainframes. The cost of the cache for a system like the Compaq 386 is on the order of $300 to $500. The support circuitry would probably have to be placed in a custom chip or gate array. Dynamic RAM in a cache memory system is often "nibble-mode" dynamic RAM, because a cache will typically load a sequential block of data into static RAM in anticipation of using adjacent data. Nibble-mode simply allows four sequential bits to be read from one chip at very fast speeds, allowing the cache to fill the block of static RAM as quickly as if it were reading a single item.

The speed degradation of cache memory compared with static RAM is on the order of 12 percent. Cache memory is not a good choice for systems of only a few megabytes because the payoff is too low. It does, however, prove to be effective in larger memory configurations.

DYNAMIC RAM Paged memory systems use dynamic RAM exclusively and divide it up into two or more banks. Sequential access to data is performed by accessing one bank and then another, instead of accessing all of one bank and then all of the next. The speed advantage is most readily apparent in multiple word accesses.

PAGED-MEMORY PROBLEM The problem with the paged memory approach is that the large size of memory increments means multiple banks need to be added at the same time. In the case of a two-bank, 32-bit memory with 4 parity

bits (one for each 8 data bits), the minimum size is 72 chips. The Access 386 machine (see sidebar "Speed Is the Essence of the Access 386") uses page memory with 64K by 4 chips, which means that these 256K-bit RAMs require 18 chips for a minimum memory size of half a megabyte. The paged memory system is also about 15 percent slower than static RAM.

Static-column RAM is a special form of dynamic RAM; it works like paged memory except that the minimum size for memory increments is much smaller. Static-column RAM works just like dynamic RAM for any random access, but subsequent sequential accesses operate like static RAM with no additional delays. The name is related to how dynamic RAM works.

Typically, dynamic RAM uses a multiplexed address bus where addresses are presented in two halves. The first is called the row address, and the second the column address. Static-column RAM works just like static RAM if the row address stays the same and only the column address changes.

Static-column RAM is about 15 percent slower than static RAM and a few percentage points slower than cache memory. The cost difference between static-column and conventional dynamic RAM is minimal.

Dynamic RAM alone is the cheapest approach but also the slowest, typically 25 percent slower than static RAM. Unfortunately, sequential accesses result in no speed gains.

In the case of the 80386, cache memory, paged memory, and static-column mode approaches look good. Cache-column seems to be the most cost effective because the 80386 fills its instruction queue from sequential addresses and the memory system size can be relatively small and inexpensive.

— *William G. Wong*

SPEED IS THE ESSENCE OF THE ACCESS 386

The Access 386 has speed and reliability, but the lack of advanced hardware makes it look more like a fast AT than an entirely new machine.

It's best to think of the Access 386 as a high-performance AT compatible rather than a magic supermachine. If you're looking for processor speed, you'll find the Access 386 to be about twice as fast as an 8-MHz IBM PC AT. If you're looking for anything else, you're going to be disappointed.

The Access 386 is built around an 80386 microprocessor running at 16 MHz. The ROM BIOS is from Phoenix Software. Although you can start out relatively inexpensively at $3,990, the lowest-priced Access 386 unit has only 512K bytes of memory and a high-density floppy disk drive. It does not include a hard disk or video adapter. The machine Advanced Logic Research sent us was the $6,949 model with a 30-megabyte hard disk, 2.5 megabytes of RAM (expanded), and an EGA.

From the outside, the Access 386 looks like an AT compatible. The inside gives away the secret, with two longer expansion board connectors and an empty square socket waiting for an 80387 math coprocessor. The system board includes a parallel and serial port and has 512K bytes of RAM organized in eight banks of two 64K-bit by 4-bit chips and one 64K-bit by 1-bit chip each. The 120-nanosecond memory chips are interleaved so that sequential memory accesses require no wait states, but random memory accesses require two wait states.

The eight expansion slots include two 8-bit (PC-style) slots, four longer expansion board connectors (AT-style) slots, and two 32-bit slots, which are ALR's own design. They plan to have memory boards that take advantage of these slots available soon.

AT-TYPE BOARD The ALR Challenger Multifunction board currently available for the Access 386 is essentially an AT-type extended memory board that can backfill conventional memory. It

uses a 16-bit slot, holds 2 megabytes on the main board and another 2 megabytes on a piggyback, and includes an additional parallel and serial port.

In general, benchmark tests that measure only processor speed show the Access 386 to be about twice as fast as an 8-MHz IBM PC AT. That's the best we could do, and the rest of the system didn't show this same improvement. The hard disk clocked in either about the same or slightly slower than an AT hard disk. The high-density floppy disk drive seemed to have an annoying start-up delay that was not revealed by our tests.

Perhaps the first thing that colors one's perceptions of the speed of a PC compatible is how fast it works on the DOS command level. When you execute a DIR command and the listing shoots up the display like a rocket, you feel good about it. This speed depends upon display update times, and here the Access 386 has problems. On the machine we tested, display updates that use the Access 386's EGA BIOS were about 20 to 30 percent slower than an IBM EGA board on an 8-MHz IBM PC AT.

ALR's VIVID EGA included with the Access 386 enhanced color model is a

half-length board designed around the Chips and Technologies EGA CHIPSET and a Phoenix ROM BIOS. Part of the problem is the Phoenix BIOS. Although the BIOS is relatively bug-free, the BIOS teletype routines that DOS uses for writing to the display are 15 to 25 percent slower than the BIOS in IBM's EGA when run on the same machine. (The rest of the difference is due to additional wait states during ROM accesses.)

Even writing directly to EGA display memory is not as speedy as other graphics modes is only 10 to 15 percent faster on the Access 386 than on the 8-MHz AT. Part of this problem is the bandwidth of the EGA itself, but some of it may also result from conservative bus timings on the 8-bit slot used for the EGA. Obviously ALR had to make some trade-offs between speed and reliability so that existing boards can run off this bus. ALR told me it would prefer to err on the side of reliability. I had no problems with reliability, so it seems to have succeeded.

FAST GRAPHICS Some graphics display benchmark tests programmed in *Microsoft Windows* fared a lot better, showing between a 40 and 100 percent improvement on the

The Access 386 from Advanced Logic Research is built around an 80386 microprocessor running at 16 MHz. From the outside, it looks like an AT compatible, but benchmark tests showed that it ran about twice as fast as an 8-MHz IBM PC AT.

Access 386 compared with an 8-MHz IBM PC AT. The lower increases here are for those routines that spend more time actually writing to the display than figuring out what needs to go there.

So, will an Access 386 help you get more work done? That depends. If much of your work frequently makes the little red hard disk indicator light up, or if there's a lot of video display manipulation, then probably not by much. When the Access 386 is thinking, it's thinking fast. When it comes time to talk to the hardware, however, it slows down to AT speeds. Now that we have the processor speed, it's time to get the rest of the hardware up to the same standards.

—Charles Petzold

■ $6,500 for the basic Deskpro 386 is a little more than what IBM charged for its first AT.

WHO NEEDS IT? Compaq sees seven markets for the Deskpro 386:

■ Power users. With the advent of the 386, 8088-based PCs will be the province of the home/casual user market, and AT-class 286 machines will be routine business PCs.

■ Software developers. To write 386 software, you need a 386 machine.

■ CAD/CAE markets, especially with Xenix-based software. But go to third parties for larger, higher-end workstations.

■ Xenix small-business and multiuser applications. Xenix 386 will be available in the first half of 1987, and other UNIXs will be ported by popular demand, Compaq believes.

■ Network file server. Who wouldn't want 130 megabytes on tap with access times half that of an AT's?

■ Artificial intelligence. A minicomputerlike 32-bit environment makes AI's memory and processor demands more feasible. The most popular applications won't be pure AI, Compaq believes, but spreadsheets and databases that use AI to be more user-friendly and even to anticipate logical next moves.

By the way of comparison, $6,500 for the basic Deskpro 386 is a little more than what IBM charged for its first AT in August 1984. Some critics may argue that the price should be equal to an AT's (about $5,300), but it's easy to imagine IBM, were it first to market, pricing a 386 machine much higher.

The machine will really shine when new software becomes available to use the 32-bit operating mode directly. In the meantime, its advanced architecture and faster clock rate puts it in a class above the IBM PC AT and most AT clones. If you are buying for today and tomorrow, then the Compaq 386 may be the best choice. ⊠

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INTEL'S 32-BIT WONDER: THE 80386 MICROPROCESSOR

*The chip itself is small. What it can do is not.
But for now the real story is
memory, not speed.*

T he Intel 80386 chip that powers the new Compaq computer is a full-fledged, 100 percent, no-ifs-ands-or-buts 32-bit microprocessor. It contains 32-bit internal registers, accepts a 32-bit memory address, and handles 32-bit data transfers.

This is big-league stuff. In the 32-bit arena, you're talking workstations, minicomputers, and even mainframes. A PC with an 80386 is a far cry from the PC originally designed by IBM 5 years ago to compete with the Apple II.

Yet the 80386 fits right in with its predecessors in Intel's line of microprocessors since the 8086. Despite its dramatic increase in capability, the 80386 retains almost complete upward compatibility with the earlier 8086, 8088, 80186, 80188, and 80286 chips. Virtually anything that runs under those microprocessors will also run under the 80386. We'll be exploring later how Intel has managed this feat.

This is mostly a story about numbers. *Big* numbers. Although 32 bits may not seem very big, everything in computers is in powers of 2. When we talk about memory, 2 to the 32nd power (or about 4 billion) is a very big number, and 4 billion is not the biggest number we'll encounter here. Figure 1 will help you keep the metric prefixes straight as we go beyond the more familiar kilobytes and megabytes to explore the vast regions of gigabytes and terabytes.

BIG, BIGGER, GIGANTIC To better understand how the 80386 has both evolved from and gone far beyond its ancestors, we'll be taking a little historical tour through Intel's line of microprocessors since the 8080.

Figure 2 shows how these chips have grown over the years. The amount of physical memory a microprocessor can access

depends on the number of address lines that emanate from the chip. Each additional bit doubles the amount of addressable memory.

Until the 80386, Intel has increased memory in steps of 4 more address bits that enlarge the address space by a factor of 16. This increase is nice but not always sufficient. The 1 megabyte of memory in the PC once seemed limitless, but already people are asking if the 16 megabytes of the 80286 will be enough.

The 80386 stops fooling around. It has 32 address lines and can directly access 4 gigabytes—256 times as much memory as the 80286 and 4,096 times as much as the IBM PC's 8088.

We'll have to wait awhile before we can actually contemplate getting at that full 4 gigabytes. The most prevalent memory chips in use today store 256 kilobits each. You need nine of them for 256 kilobytes of parity-checked memory. A memory board like the Intel Above Board has 72 of these chips for 2 megabytes of memory.

If you want 4 gigabytes of memory, you'd need more than 2,000 Above Boards, a PC chassis 125 feet wide to hold them all—and don't even think about your electric bills.

ADDRESSING THE BYTES On the machine-code level, a program accesses memory with addresses that are stored as values in the internal registers of the microprocessor. As Intel's microprocessors have evolved over the years, the methods of translating these registers into a physical memory address have become increasingly more complex.

The 8080 microprocessor that powered many pre-PC CP/M computers has 16 address lines and accesses 64 kilobytes (2 to the 16th power) of memory. Although the 8080 is an 8-bit microprocessor, the *instruction pointer* (a register used to address machine code) is 16 bits wide. For addressing data, the 8080 simply used two 8-bit registers stuck together. The resultant 16-bit value simply pointed to an address in the 64K-byte memory space, as shown in Figure 3.

BREAKING IT INTO SEGMENTS The Intel 8086 (and the 8088 used in the IBM PC) was designed to be upwardly compati-

Inside the INTEL 80386 Microprocessor

Inside the Intel 80386 microprocessor are 32-bit internal registers. The chip generates a 32-bit memory address and handles 32-bit data transfers. It retains, however, complete compatibility with anything that runs on earlier 8088 and 80286 chips.

ble with the 8080 on a source-code level. (Although the 8080 machine code itself couldn't be executed by the 8086, an 8080 assembly language program could be converted into equivalent 8086 machine code.) Yet, the 8086 can address 1 megabyte of memory, which requires a 20-bit address.

Rather than introduce a 20-bit register into the 8086, Intel split the 20-bit address into two pieces—a 16-bit *segment* address and a 16-bit *offset* address. These two pieces are stored in different registers. The microprocessor shifts the segment address 4 bits (effectively multiplying it by 16) and adds the offset address. The result is a 20-

bit address that can access 1 megabyte of memory. This split and shift is shown in Figure 4.

Each of the four segment registers in the 8086 defines a 64K-byte block of memory called (appropriately enough) a *segment*. If all the segment registers are kept constant and equal, then the microprocessor can access only 64K bytes of memory, just like the 8080. That's what upward compatibility is all about.

Segmented memory has certain advantages and disadvantages. On the one hand, a program need only manipulate a convenient 16-bit offset address for most purposes. On the other hand, segmented

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memory drives programmers crazy. Using a block of memory greater than 64K bytes is very messy. This accounts for the 64K-byte limits that often show up even today in many programs for the PC.

UPWARD AND ONWARD The 80286 and 80386 microprocessors both support and go beyond the segmented addressing scheme of the 8086.

When the 80286 and 80386 are first powered up, they operate in what Intel calls *real mode*, which uses segment and offset registers in the same way as the 8086 to access the same 1 megabyte of memory. Thus the 80286 and 80386 microprocessors are upwardly compatible with the 8086 chip.

This convenience of compatibility was illustrated by the great ease with which software written for the PC's 8088 was ported to the PC AT's 80286. Most programs ran fine without changes. The ones that didn't usually had problems that resulted from AT hardware changes or copy-protection schemes.

At owners have long known about the elusive *protected mode* of the 80286. You've heard about the promise of 80286 protected mode (16 megabytes of memory), the problem (DOS doesn't yet support it), and the catch (even if DOS did support protected mode, none of your existing programs would run under it).

Yet, even in protected mode, the 80286 and 80386 are still able to retain a high level of compatibility with the 8086. In protected mode, programs continue to use the same segment and offset registers as they do in real mode.

The difference with protected mode is that the segment register is no longer a real address. Instead, the 80286 microprocessor uses the upper 14 bits of the segment register to look up a 24-bit *base address* stored in a *descriptor table* also in memory. The 80286 adds the 16-bit offset address to this base address. The 24 bits allow access to 16 megabytes of memory instead of 1 megabyte. This is shown in Figure 5.

Protected mode doesn't just mean more memory. The on-chip memory management and multitasking abilities of the 80286 and 80386 are also part of protected mode. With protected mode, segment reg-

Speaking Greek

One:	is this many bytes:	The prefix:	means:	from the Greek:	originally meaning:
Kilobyte	1,024	kilo	thousand	khilioi	thousand
Megabyte	1,048,576	mega	million	megas	great
Gigabyte	1,073,741,824	giga	billion	gigas	giant
Terabyte	1,099,511,627,776	tera	trillion	terasi	monster

isters are not simply a device to drive programmers crazy (although they still do). Instead, they define the way that memory is organized between tasks. Each task has its own descriptor table describing the segments for that task, and that (along with the registers) is virtually all that the chip needs to store to switch between tasks. Since physical addresses are stored in the descriptor table rather than in the segment registers, the operating system can move memory around without programs knowing (or caring) about it.

It's called protected mode because segments belonging to one task are protected from being corrupted by another task. Tasks are organized in privilege levels, and certain machine-code instructions are prohibited to lower privilege levels. In a well-designed protected-mode operating system, a single program can neither crash the whole system nor get itself into an unrecoverable state.

The major problem of designing a multitasking protected-mode DOS is getting it to run existing programs. For instance, many programs written for the 8088 microprocessor manipulate segment registers based on the assumption that they reflect real addresses. In protected mode, they do not. (For more on this topic, see

sidebar "Protected Mode? You Mean Neglected Mode!")

The 80386's use of protected mode is a good news/bad news story. The bad news is that protected mode of the 80386 presents most of the same problems for DOS and existing programs as 80286 protected mode. The good news is that 80386 protected mode has two big bonuses.

First, the base address associated with each segment is not limited to 24 bits, as in the 80286. It is 32 bits wide and thus can be anywhere within the 4 gigabytes of addressable memory. Of course, if the top 8 bits of the base addresses are set to zero, then the 80386 works just like the 80286.

The second bonus in protected mode is that the offset addresses are also expanded from 16 bits to 32 bits. This is shown in Figure 6. Suddenly, with one stroke, that persistent 64K-byte segment limit—even more of a nuisance in 80286 protected mode—simply disappears. In 80386 protected mode, we're now looking at a 4-gigabyte maximum segment size.

MONSTER MEMORY The 80286 and 80386 protected modes both use the upper 14 bits of the segment registers to look up a base address in a descriptor table. This implies that the microprocessor and operating

PROTECTED MODE? YOU MEAN NEGLECTED MODE!

The score is Intel 2, Microsoft 0. The second chip that is a superset of the 8088 is upon us, and we're still limping along with the same old operating system. At this stage of the game, it doesn't look like we'll see DOS 5 anytime this year.

What's the big deal? There's a lot of power going to waste inside every 80286, much more in the 80386. Applications developers are standing in line to get at the increased memory and multitasking that DOS 5 promises to un-

leash. And while they have waited patiently, the 80286 has become the everyday chip. First Tandy and now IBM have incorporated the 286 into their XT-level product lines.

The technical hurdles are formidable to developing a multitasking operating system that is at least nominally compatible with earlier versions of DOS. It's safe to say that Microsoft isn't delaying its introduction on purpose. So maybe it isn't neglected mode but protracted mode.

—Bill Machrone

system can maintain 16,384 different segments.

In the 80286, each of these 16,384 segments can be as large as 64K bytes. When you multiply these two values, it seems as if you might have access to 1 gigabyte of memory instead of the mere 16 megabytes that the 80286 can physically access.

In fact, you do. The 1 gigabyte of potentially addressable memory is called *virtual memory*. The 80286 microprocessor itself can only physically address 16 megabytes. However, the descriptor table can indicate whether a particular segment is actually in physical memory or somewhere else—for instance, on a high-speed hard disk. Thus an operating system that

implements virtual memory could be notified (by the microprocessor through an interrupt) when a task tries to use a segment of memory not physically present. The operating system could then swap the segment from the hard disk into memory.

Once again, the 80286 functions similarly, but blows up the numbers to unfathomable limits. While the 80386 still defines 16,384 separate segments, each segment may be as large as 4 gigabytes. Thus the 80386 can manage up to 64 terabytes of virtual memory.

You can think of a terabyte as a trillion or get a better idea of what we're talking about by going back to the Greek prefix, *teras*. It translates as "monster."

VIRTUAL 8086 MODE The 80386 still has one more addressing feature that is so simple, so elegant, and so right that you may end up wishing the 80286 had never existed—or at least had not established its market stronghold in the AT and the AT compatibles.

The problem with 80286 protected mode is that it is simply too big a step up from real mode for programs written in the "anything goes" environment of the IBM PC. There's just nothing halfway between real mode and protected mode to ease the transition.

The 80386 has this intermediate step, and it gives the 80386 much more backward compatibility with the 8086 than the 80286 does.

It's called *virtual 8086 mode*. As the name implies, the 80386 can mimic a 1-megabyte addressing environment that to existing programs appears to be an 8086. But it's not real mode, because more than 1 megabyte is available. The 80386 can actually maintain more than one virtual 8086 environment in memory at the same time. Each of these environments can have its own copy of DOS and an applications program. At the same time, a protected-mode operating system and applications can be using a different area of memory.

Let's see how this works.

In virtual 8086 mode, the 80386 treats the segment registers the same way as in real mode, where they represent real addresses. Thus, existing DOS programs (and DOS itself) can do all the ugly things

PC MAGAZINE
Microprocessors Since the 8080

Figure 2: *Intel's microprocessors since the 8080 have become increasingly more powerful and sophisticated while maintaining compatibility with previous chips.*

8080	8086	8088

| 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |

8080

Data types	8 bits
Data path	8 bits
No. of address bits	16
Physical memory	64 kilobytes
Virtual memory	N/A

8086

Data types	8, 16 bits
Data path	16 bits
No. of address bits	20
Physical memory	1 megabyte
Virtual memory	N/A

8088

Data types	8, 16 bits
Data path	8 bits
No. of address bits	20
Physical memory	1 megabyte
Virtual memory	N/A

it currently does with segment registers and not run into the problems associated with protected mode.

But won't the addresses from multiple virtual 8086 sessions collide when they access physical memory? No, because when the 80386 adds the segment and offset registers together, it creates not a physical address, but a *linear address.* A set of paging tables translates the linear address into a physical address. This physical address may be anywhere in the 4 gigabytes of the 80386 addressable memory.

The paging hardware (which is not limited to virtual 8086 mode) works with 4K-byte blocks of memory. The pages can be set up so that some memory (for instance, a single ROM BIOS) is used by several virtual 8086 sessions. Virtual 8086 mode very nicely solves the problem of allowing programs that write directly to the display memory to be multitasked. The address of the display could be mapped to another location in memory and transferred to the real display during program switching. Alternatively, the operating system could combine display output from several virtual 8086 sessions into a single-windowed real display.

To make this complete, all interrupts and all I/O port accesses initiated by programs in virtual 8086 mode can be trapped by the operating system that has set up these virtual 8086 environments. To correctly handle these I/O port accesses, this operating system would have to have complete knowledge of all hardware that may

be directly accessed by more than one virtual 8086 session.

BUT IS IT GOOD FOR US? This virtual 8086 mode raises some sticky issues. In the long run, we will all be better off with a strictly protected-mode DOS that can only run programs that adhere to the rules of the operating system. There's some bullet-biting involved here both for software manufacturers (who will have to upgrade their products) and users (who will have to pay for them). Once this happens, however, there will be no looking back. We'll have a real, grown-up operating system instead of the CP/M clone we're using now.

Would an operating system that implemented virtual 8086 mode take us toward protected mode because it doesn't cripple existing programs in the transition period?

Or would it just make us lazy?

As we ponder all of these questions, the 80386 paging hardware has already been used by Compaq to implement—of all things—Lotus/Intel/Microsoft expanded memory.

Paging is really just bank-switching, where different areas of memory appear at different times to be at the same physical address (or just the opposite). The beauty of Compaq's implementation of expanded memory (aided by the device-transparent nature of the LIM specification) is that the expanded memory requires no extra hardware aside from the memory itself. Everything is done in software using features internal to the 80386.

■ In the long run, we will all be better off with a strictly protected-mode DOS that can only run programs that adhere to the rules of the operating system.

BIGGER DATA BESIDES We've been talking mostly about the huge amounts of memory the 80386 can address. Yet inside the chip where all the number-crunching goes on, the 80386 also shows significant improvements over its ancestors.

The Intel microprocessors from the 8086 through the 80286 use 16-bit internal registers and can only crunch 16 bits at a time. When a program has to add two 32-bit numbers, it must do it in two pieces. The multiplication of two 32-bit numbers is even worse, requiring four 16-bit multiplications and several additions.

But no more. All of the 16-bit registers (except the segment registers) in the 8086 and 80286 have been expanded to 32 bits in the 80386. All of the machine code instructions involving 16-bit registers can

	8086		
Data types	8, 16 bits		
Data path	16 bits		
No. of address bits	20		
Physical memory	1 megabyte		
Virtual memory	N/A		

	8088		
Data types	8, 16 bits		
Data path	8 bits		
No. of address bits	20		
Physical memory	1 megabyte		
Virtual memory	N/A		

	80286		
Data types	8, 16 bits		
Data path	16 bits		
No. of address bits	24		
Physical memory	16 megabytes		
Virtual memory	1 gigabyte		

	80386		
Data types	8, 16, 32 bits		
Data path	32 bits		
No. of address bits	32		
Physical memory	4 gigabytes		
Virtual memory	64 terabytes		

1980 1981 1982 1983 1984 1985 1986

Figure 3

16-Bit Address

64 Kilobytes

Figure 4

15-Bit Segment

16-Bit Offset

20-Bit Address

1 Megabyte

Figure 5

16-Bit Segment

24-Bit Base Address

+

16-Bit Offset

24-Bit Address

Descriptor Table

16 Megabytes

Figure 3: *Memory addressing in the 8080 microprocessor is as simple as addressing can be. The simplicity, however, limits the 8080 to 64K bytes of memory.*

Figure 4: *The 8086 can address 1 megabyte of memory, but continues to use 16-bit registers for addressing. It does this by calculating a 20-bit address from separate segment and offset registers.*

Figure 5: *By using the segment registers to look up a 24-bit base address in a descriptor table, the 80286 protected mode expands the amount of addressable memory to 16 megabytes.*

Figure 6: *The 80386 protected mode works like that of the 80286 but expands both the base address and the offset to 32 bits. This allows access to 4 gigabytes of memory.*

Figure 6

16-Bit Segment

32-Bit Base Address

+

32-Bit Offset

32-Bit Address

Descriptor Table

4 Gigabytes

■ While the 80286 can read or write memory 16 bits at a stroke (and the 8088 only 8 bits), the 80386 has a full 32-bit data path between processor and memory.

accept a prefix that makes them operate on 32-bit registers instead. These 32-bit instructions are available both in real mode and protected mode.

The 80386 also has a wider path to the outside world. While the 80286 can read or write memory 16 bits at a stroke (and the 8088 in PCs and XTs only 8 bits), the 80386 has a full 32-bit data path between processor and memory. The 80386 can transfer data from one area of memory to another twice as fast as an 80286 operating at the same clock speed because it can move 32 bits at a shot instead of just 16.

Of course, the 80386 can use this 32-bit data path only when it has had a real physical path along the bus that connects the system board with expansion cards. This is why a bus standard for the 80386 machines is so important.

THE ESSUE ISSUE Comparisons of benchmark test results between the 16-MHz Compaq Deskpro 386 and the PC's Limited 16-MHz 80286 machine don't show significant differences in speed.

This is to be expected. In terms of clock cycles, many of the 80386 instructions take about the same time as the 80286's. However, with the exception of multiplication and division, the 80386 can crunch 32-bit numbers just as fast as 16-bit numbers. The benchmark programs obviously do not use the 32-bit data registers in the 80386. This would require assembly language programs or high-level language compilers written for the 80386. (Of course, any program that used the 32-bit

XENIX 386—WHERE THE ACTION IS

Coincident with Compaq's rollout of the Deskpro 386, Microsoft has announced the *Xenix 386 Toolkit.* An addon to the existing *Xenix System V/386 Toolkit,* it allows developers to begin development now for Xenix System V/386, which will be shipped in the first quarter of 1987.

The *$395 Toolkit* comes in two parts, a development environment and an execution environment. The first allows developers with 80286-based machines to write Xenix programs for System V/386. It consists primarily of new versions of the C compiler and macro assembler.

The execution environment requires an 80386-based machine for testing and debugging, because it is impossible to emulate all the additional 80386 modes of operation on the 286.

Xenix has turned out to be quite a success among many users of 80286-based machines. Estimates of the number of ATs running Xenix run as high as one out of every five machines. MicroAge and Businessland sell more than their fair share of Xenix, and the numbers appear to be increasing. A surprising number of businesses are willing to forgo stalwart DOS programs for multiuser applications. And Xenix isn't a dead end there, either. One value-added reseller of Xenix, Santa Cruz Operation, has workalike products that give Xenix users close approximations of *dBASE* and *1-2-3.* SCO and several other Xenix houses have networking and communications programs that allow Xenix and DOS machines to be interconnected tightly in the office.

The Deskpro 386 looks like a very capable UNIX box. It is fast overall, with a large, fast disk and static-column RAM, which gives cache-like speeds everywhere in the address space. It will be all the more attractive with Xenix 386, since it uses the 386's full capabilities, including 4 gigabytes of virtual memory, the 32-bit instruction set, and 32-bit data types. Altos and NCR, the leaders in small departmental UNIX machines, will have serious new competition.

Best of all, the new Xenix is compatible with older versions of Xenix, so existing programs will run without modification. Now if they could just turn some of their attention to DOS. . . .

—Bill Machrone

registers of the 80386 could not be run on an 80286.) But the potential is there.

Without software specifically written for it, the 80386 will use 32-bit memory accesses only while fetching machine-code instructions. This is an improvement over the 80286, but not as much as it may seem at first. Both chips have separate instruction-fetch queues that operate independently of machine-code execution. Intel estimates that the instruction fetch adds about a 5- to 10-percent overhead to 80286 execution times. The estimate for the 80386 is 5 percent.

The 80386 has the potential to access some memory faster than the 80286. Using a pipelined instruction execution, the 80386 can make an address available to a memory board one clock cycle earlier that it normally would be. Memory designed to accept and use this early address can operate with one less wait state than it would otherwise. Compaq's use of static-column RAM (see sidebar "What Kind of RAM?") takes advantage of this feature.

Twelve years ago when the 8080 microprocessor first became available, no one everyone agreed that it could power a small computer. To some (including Intel), it seemed more appropriate as a programmable logic device. And even if you could make a computer out of it, what could people possibly use one for?

With the 80386, there's no longer any doubt about what it was designed for and what we can use it for. The 80386 is for doing work. Lots of it. ▣

Charles Petzold is a contributing editor of PC Magazine.

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of computing.*

My check's in the mail, Mr. Canion.

The waltzing's over and the real game has begun. Now all of us who've been expressing such fervent affection for PCs built around Intel's 80386 microprocessor can actually buy one. And a lot of us will. And we'll love it. But a bunch of MIPSy PC-speed freaks, hell-bent on reducing *1-2-3* recalc times to negative numbers, do not a market make. Or do we?

Compaq makes it clear that the Deskpro 386 isn't a machine which it plans to lose money on. Yet it's priced relatively aggressively—more than relatively, I think, but some of my colleagues differ—and Compaq says it knows perfectly well this isn't a machine that will sell in huge volumes this year, nor, probably, next.

So what gives? Compaq's never been a company to forsake margins, and after its successful crusade to push operating margins over the 40 percent threshold earlier this year, the company is not likely to get soft-headed about money now.

The key to understanding the Deskpro 386 from Compaq's perspective is that it's a positioning exercise, though not the kind of standard-setting positioning game most people see. And the key to understanding the machine from the market's perspective is that it's a performance machine, though it won't offer the kind of performance most observers will initially expect.

Let me unravel that a bit.

SPEED AND POSITION PLAY First, on the positioning aspect of the Deskpro 386: No, as Canion and everyone else at Compaq insists, this isn't an effort to set a new standard. Instead it's an effort to position Compaq as a technology leader, not follower; and more, it's an effort to fracture the idea of a single "IBM PC standard" by showing there's going to be more

than one way to deliver DOS applications.

And second, on the value of the machine: As fast as the Deskpro 386 is (at 15 times the speed of the original PC and four times the speed of a 6-MHz PC AT on real-world tasks, it's pretty damned fast), this move isn't primarily a speed play, it's a memory play.

Those two themes are intertwined in the Deskpro 386. Understanding who's going to buy one, why, and what that means for Compaq and the rest of the business, requires some discussion of both points.

Compaq earned its Fortune 500 slot through strict adherence to the IBM PC technical standard (which translates into near-absolute DOS-applications compatibility), combined with small but useful improvements in the convenience factors that attract us to one or another PC.

The original Compaq portable not only ran almost everything that ran on the IBM PC, it put that power in a sort-of-portable box, and it put graphics and high-quality text on the same built-in monitor. In other words, it provided compatibility plus a little more value.

The Compaq Deskpro was almost lost to history when IBM announced the PC AT just a couple of months after the Deskpro was announced. But it survived as an effective competitor to the PC-XT because it was a little faster, and because it accommodated built-in tape backup when backup was almost unheard of. Again, compatibility plus a little more value.

> ■ Rather than setting any singular standard for the 386 PCs, Compaq is showing us that there can be several viable hardware approaches in the 80386 market.

The Compaq 286s came out 9 months after the PC AT but offered a third more speed than the AT. The same compatibility-plus-incremental-value equation again.

OUT FROM UNDER But it gets awfully old being the guys who wait till IBM shows how, then tweak the standard a little. That itch to step out from under a deep blue shadow encountered the market opportunity presented by the 80386 chip, and Compaq responded by seizing the moment. The next challenge for Compaq as a company was to demonstrate that it wasn't just a sophisticated me-too'er but capable of leading the market—which it has done.

That's a great deal different, though, from "setting the standard for 80386

PCs," which has been one widely reported interpretation of its plan. Precisely to the contrary, rather than setting any singular standard for 386 PCs, what Compaq's really doing here is showing us that there can be several viable hardware approaches—not, please, "standards"—in the 80386 market.

On one level, 80386 PCs are just big, fast single-tasking/single-user machines—"Turbo AT's"—in a phrase you'll probably be hearing a lot over the next few months. But thanks to the 80386 chip's capacity for virtual machine functions—equivalent to creating several concurrently operating, electronically separate, DOS-compatible PCs within one 80386 PC—386s represent a new kind of functionality, an opportunity for innovative operating systems extensions.

And it's that virtual machine capability that makes whatever IBM does to make its 386 PC proprietary largely irrelevant. Which in turn makes the early 386s safe buys for power-hungry PC users.

Softguard angered a lot of PC users with its frustrating copy-protection schemes (still used by Lotus and formerly used by Ashton-Tate, among others), but it's going to make up for that in the eyes of a lot of people with its VM/386 operating system on 386 machines.

Just imagine an operating system that loads first then sets up and manages several concurrent PC-DOS/MS-DOS sessions. In each, a copy of DOS and a familiar ap-

Compaq Takes the Lead in the Technology Race

	8088	8086	80286	80386
	1981	1982	1983	1984	1985	1986
IBM	PC		PC-XT	PC AT		
COMPAQ		PORTABLE		DESKPRO	DESKPRO 286	DESKPRO 386

IBM products have not always been state-of-the-art at introduction, but the marketplace has generally waited for IBM to make the first move: in August 1981 the 8088-based PC was innovative and courageous. Compaq introduced its first machine, the

Compaq Portable, in November 1982, 15 months later. In March 1983 the Eagle 1600 was shipped, the first 8086-based machine. Compaq was 15 months behind when it introduced the 8086-based Deskpro, its first high-performance desktop machine.

The race got much slower with 80286-based machines. IBM introduced the PC AT in August 1984, Compaq followed with its Deskpro 286 in April 1985.

The race has now completely turned around. Compaq introduced the Deskpro 386 this

September. The days of letting IBM move a market are gone. When IBM's 386 machine finally emerges, will it be Compaq compatible?

■ MARKETING THE 386

■ Fast 80286 machines are going to be with us for a long time, and, with better operating system support, they are going to deliver a lot of value.

plications program run to their hearts' content, at high speed, with as much memory as they need. That's a virtual-machine operating system, and that's what's coming on the new 386s. Softguard's saying it can deliver VM/386 during the first or second quarter of next year; I suspect it may be a little sooner.

WINDOWS SOLUTION That's one way to carve up the processing-speed and memory resources of a 386 PC to dramatically increase its convenience and effective power. Another way is to use our old friend *Windows*, from Microsoft. *Windows* yearns for the kind of processing and memory addressability of the 386 PCs. What's been largely overlooked about *Windows* so far, in all the moaning and groaning about its sluggishness and memory hogging, is that *Windows* is in fact a virtual-machine system.

With a slick interface, a few tools built in, a 16-MHz clock speed, the high resolution of the now-standard enhanced EGA, a range from Intel's graphics-processing chip, and—finally—access to enough memory to assign RAM to applications pretty much as needed, *Windows* is no doubt going to come into its own.

You'll notice I've gotten this far without talking about DOS 5.*x* and 6.*x*. That's because VM/386 and a new 80386-oriented *Windows* are going to be able to deliver what most of us have been waiting for in a new DOS on the 386 PCs.

The inability to directly address more than 640K bytes of user RAM is far and

away the single largest problem with current versions of DOS. With access to enough contiguous memory (2 or 3 megabytes as a minimum, 7 or 8 if we want it), all the obvious solutions we use to get around present DOS problems—from TSR-programs' collisions to memory-hogging *Windows* environments to the LIM EMS scheme to a lack of concurrence—can be disposed of. Quickly. And will be.

That's why although the appeal of these first 386 PCs seems to be 16-MHz operation, in fact their real advantage isn't processing speed but the memory addressability of the 386, combined with VM-style operating systems—and yes, with DOS 5.*x* for those who want to have simpler lives.

386 APPEAL Certainly not everyone is going to need or want a 386 PC. Fast 80286 machines are going to be with us for a long time, and, with better operating system support, they are going to deliver a lot of value. We'll see fast, compact 80286 PCs become the new office-automation standard, as de facto dedicated word processors and, as computers for those who don't rely on their PCs as primary tools.

I think 286 PCs are going to be the XTs of the next few years: unexciting, trailing-edge machines that will get awfully cheap awfully fast and deliver a phenomenal amount of value for their modest cost.

But those who really use their PCs, rather than decorate their desks with them as Yuppie icons, aren't going to be able to resist the temptation of 386s. The immediate market isn't large, and it will grow more slowly than other new-chip PC markets have.

But for the power user, buying a Deskpro 386 is an investment in the future of computing, a machine unlikely to be edged off anyone's desk for a long, long time.

The Compaq Deskpro 386 is a classy opening act for the era of the desktop microframe and is going to define that market almost as powerfully as it redefines Compaq's position in the computer industry itself.

Jim Seymour is a contributing editor and columnist for PC Magazine.

TAKING UP

RESIDENCE

O nce upon a time, PC users were
unhappy because their PCs could do only one thing at a time. Pray as
they might for multitasking, IBM and Microsoft would not yield to their
pleas. Finally, in DOS 1.1, IBM and Microsoft relented and threw us-
ers a bone, the terminate-but-stay-resident (TSR) function call, and
with it a few utilities for printing while doing something else.

Still, users were not satisfied. These utilities were helpful, but they
weren't interactive. All they did was sit on top of DOS in memory and
operate exclusively in the background. Users wanted more.

Although IBM and Microsoft remained unmoved, rival software de-

▼

*Users invited RAM-resident programs into their machines
to get around the fact that DOS isn't a multitasking operating system. But the
solution has turned into a problem as pop-ups fight with other
programs for control. What next?*

velopers did not. Quick to see the possibilities inherent in the TSR call, they invented the pop-up utility. First came keyboard enhancers, followed by desktop accessories—most notably, Borland International's *SideKick*. *SideKick*'s phenomenal success started an epidemic of RAM-resident fever. Hungry software developers turned every conceivable application into a pop-up program: drawing programs, communications programs, thesauruses and spellers, appointment calendars, copyprotection defeaters, and screen-capture programs, to name just a few.

Users have eaten up these marvels, but now they are suffering the consequences. To accomplish their miracles and beat DOS's limitations, these programs have to take some unorthodox, even outlaw, approaches. Few take the same approach, and many take conflicting approaches. Once loaded into your PC, they must fight with each other and with the resident applications programs for large chunks of memory, keyboard control, scheduling and timing control, and the choicest position in the memory stack. These once quiet, unobtrusive utilities have become a bunch of quarreling thugs, each waiting for a chance to steal your keystrokes away from other programs and the operating system.

In the heat of battle, they can freeze up the system, mess up the screen, and turn a normal day's work into a stream of unpleasant surprises.

DOS AND DON'TS The real problem is that DOS was not designed to be a reentrant and multitasking system, and attempts to make it act as one tamper with its essential functions. RAM-resident programs are trying to exist in an environment that was never meant to support them.

DOS, a direct descendant of CP/M, was created with a "small" mentality. Limited-memory, low-connectivity CP/M machines had to conserve resources, and the early implementation of DOS was written with the same conservation techniques in mind.

When you remember that DOS originally was written for a 64K-byte personal computer, it becomes clear why DOS system calls pay little attention to background operations. With that amount of memory, there's hardly room for a foreground.

The TSR call, designed for a computer with a little more memory, allows a program to return control to DOS while remaining in memory itself. The documentation explaining the TSR call was (and still is) terse. Ostensibly, the command was included to facilitate device drivers and to accommodate special peripherals attached to the PC. But the TSR was a Pandora's box that made the concept of RAM-resident software apparent to programmers and ultimately unleashed the current horde of pop-up gremlins.

TSR BLUES These pop-ups, often called TSR programs, must be loaded into memory after DOS and before the applica-

> To accomplish their miracles and beat DOS's limitations, these programs have to take some unorthodox, even outlaw, approaches.

tion, and they stay in memory while you run applications programs.

You can run more than one RAM-resident program at a time because these programs can be stacked in memory. They scan a device (usually the keyboard) and wait to receive a signal to spring into action and assume control of the PC, temporarily suspending the main application. In theory, when one RAM-resident program receives a signal from a device and doesn't want the information, it passes the information on to the next program in the memory chain. Most RAM-resident programs find it advantageous to be loaded last, so they get at the information first. But, of course, not everyone can be loaded last.

What RAM-resident programs do is intercept BIOS interrupt vectors that control keyboard, video, timing, and other handlers—small pieces of software that manage some part of the hardware, such as the disk drives, keyboard, monitor, or serial ports

(see "How RAM-Resident Programs Work (And Don't Work)"). Keyboard enhancers take over the keyboard interrupt. Disk I/O enhancers and advanced copy-protection defeaters take over the disk interrupt. Screen enhancers and some graphics programs take over the video I/O interrupt. Communications pop-ups steal the serial I/O interrupt. But they all collide at the keyboard, because almost every RAM-resident program is invoked with a "hot key."

Two resident programs using the same hot key create the most common conflict. Collisions can also occur when two programs try to achieve the same results in different ways or when two programs try to write information to the same place in memory. Memory limitations can cause trouble as well. Today's applications programs are memory-intensive beasts. By the time you load several RAM-resident programs, you may find you have insufficient room to store sizable spreadsheets, reports, or database files.

A NONINTERACTIVE ANCESTRY RAM-resident programs weren't always so aggressive. The first RAM-resident utility, provided with DOS 1.1, was MODE, a simple mechanism for redirecting printer output. DOS 2.0 contained a PRINT program to print files in the background. Other early RAM-resident utilities include ASSIGN and GRAPHICS. While only the lunatic fringe had an inkling that pop-up programs could coexist with an application, DOS's MODE and PRINT served as prototypes for early, non-keyboard-addressable RAM-resident software.

In 1982 RAM-disks and print spoolers were the most-deeply entrenched members of this genre. These programs demand little interaction. Even today, between 60 and 70 percent of RAM-resident applications operate as nonaddressable background functions that you activate with a command and never see thereafter. Printer drivers, disk-cache software, and some font software fall into this category. These programs are loaded into RAM but not used dynamically, and they aren't responsible for much of the RAM-resident conflict.

ProKey, a keyboard enhancer released

by Rosenoft in 1982, was one of the first programs that took advantage of the larger memory of the PC by using the keyboard-addressable pop-up approach. Software Research Technology's *SmartKey*, Borland's *SuperKey*, and Alpha Software's *Keyworks*, along with half-a-dozen less-prominent entries, were developed along the same lines. "Here was a microcomputer that had the addressability to deal with more memory than other microcomputers before it," recalls David Rose, president of Rosenoft.

SIDEKICK'S SCENE
In 1984 Borland's *SideKick* enchanted users and turned the pop-up philosophy into a panacea for all that ailed the single-tasking PC. *SideKick* is a pop-up desktop organizer that offers keystroke access to a notepad, appointment calendar, date book, automatic phone dialer, and an ASCII table, all for under $100.

Borland hadn't planned on marketing such a program; it had developed *SideKick* to meet internal needs. According to Philippe Kahn, Borland's president, the program was inspired by some earlier work done with a CP/M-based memory-resident calculator.

Kahn boasts that *SideKick* tackled memory-resident issues before the DOS tools to facilitate the process that existed. "Ask Bill Gates how it kicks us off when he found out that Version 1 of *Side-Kick* worked with DOS 1.0," he says. Most other memory-resident programs work only with DOS 2.0 and later.

SideKick offered a solution to a $50 problem," says Kahn. Users could treat the PC as they would their desktops. To date, more than 750,000 copies of the program have been sold. It has become the de facto RAM-resident standard. Companies that create RAM-resident software must accommodate *SideKick*. That doesn't mean that *SideKick* sets a good example: it's an aggressive user of keyboard interrupts and demands to be loaded into memory last.

While Borland was developing *Side-Kick*, Polytron Corp. was working on *PolyWindows*, another desktop utility that was released shortly after *SideKick*. *PolyWindows* drew its inspiration from a different set of DOS's inadequacies. Its

pop-up structure was originally intended to be incorporated into a pop-up debugger to aid frustrated programmers. During the project, Polytron Corp. realized how vital the pop-up technology would be to the general user.

It's no coincidence that both *SideKick* and *PolyWindows* are similar in appearance to the innovative and attractive Macintosh desktop utilities. The Mac's desktop runs concurrently with the application, and the facilities to support it are built into the operating system.

THE BORLAND DYNASTY
Borland's next RAM-resident product was *Super-Key*, a keyboard enhancer. Its latest RAM-

> ■ While Borland's products remain top sellers, an enticing array of lightning-fast pop-ups is available from dozens of competitors.

resident offering, *Turbo Lightning*, is a generic look-up system to which you can attach a library of electronic reference works. Through *Turbo Lightning*, users can currently access a resident speller or thesaurus. Borland's RAM-resident programs are unique because they are created to work together, eliminating the potential for RAM-resident conflicts and creating a kind of RAM-resident dynasty.

Borland recently announced *MOM* (Memory Organization Management), an experimental program created in response to users' requests for memory management. *MOM* works with the Borland family only. It graphically details the whereabouts of programs in memory and can manage and arbitrate between conflicting programs. At press time, Borland had not specified when or how this program would be distributed. The soon-to-be released *SideKick*, Version 2, which promises to "change the way RAM-resident programs

look," according to Kahn, may have *MOM* built in.

THE WHOLE CLAN
"In 1984, if you were Polytron or Borland, the mere knowledge of how to implement a TSR successfully was valuable proprietary knowledge," comments Jim Edlin, president of Bruce & James Software. "In 1986 any 17-year-old hacker could do it."

And has. While Borland's RAM-resident products remain top sellers, an enticing array of lightning-fast pop-ups is available from dozens of competing companies. Aggressive pricing has become a RAM-resident trademark: many products fall into the $19 to $50 range, and most cost under $100.

Typically, RAM-residents are not standalone applications. They tend to expand productivity by expanding the use of the primary applications software. Note takers allow you to annotate text or spreadsheet information. RAM-resident graphics programs capture data and display or enhance the results in graphic form. RAM-resident "copy-protection defeater" software eliminates the need for key disks. Screen-capture programs grab and enhance the current application's display screen.

Most pop-ups work with all kinds of primary applications, but a growing number of developers are succeeding by tailoring their software to a specific market. Turner-Hall Publishing of Cupertino, California, looked at an installed base of 2 million *1-2-3* users and saw the potential to create practical utilities for that market. Within the last 18 months Turner-Hall has introduced *SQZ* and *Note-It*, both designed to extend the capabilities of *1-2-3*. *SQZ* (which is not technically a RAM-resident program, although it is similar to one) compresses spreadsheet information and *Note-It* lets you attach customized notes to spreadsheet cells or labels. Both sell for $79.95. Tom Byers, general manager for Turner-Hall, claims that users of these programs demand the RAM-resident features his company provides.

Many RAM-resident developers are clearly cashing in on a new and lucrative market; others are entering that market in response to user pressure, against their own better judgment. Simon and Schuster

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is one such company: Although its *Webster's New World Thesaurus* is RAM-resident, its original *Webster's New World Speller* was not. The developers considered pop-up spell-checking too intrusive and felt that spelling was best treated as a batch process. But Simon and Schuster now plans to introduce a RAM-resident speller in response to user requests.

YOUNG AND RESTLESS Johnny-come-latelies to the RAM-resident scene are frequently labeled the bad guys. *Smart Notes*, a relatively new but very robust RAM-resident "post-it note" program. "There really isn't any other way to do our product besides RAM-resident," says Marc Peterson, president of Personics, "but as a new entrant, we're faced with a problem. When there's an incompatibility between two TSR programs, the incompatibility is blamed on us—the new product." Estab-

lishing compatibility with preexisting programs is no mean feat and expensive in terms of research and development.

The latest RAM-resident arrivals, RAM management programs, actually manage the activity of other RAM-resident

■ Johnny-come-latelies to the RAM-resident scene are frequently labeled the bad guys.

programs (see "When your Pop-ups Need a Manager"). When you decide you've had it with RAM-resident conflicts, or you find yourself with insufficient memory to handle your smallest spreadsheet, these or-

ganizers offer a solution. Much like Borland's *MOM*, they allow you to selectively turn on and off various RAM-resident programs and to keep a careful inventory of what's located where in memory.

Ray Bammes, president of Infostructures, likes to use a 200K-byte print buffer as well as a RAMdisk on a 640K machine. He says he was "forever booting" to get rid of his laser printer's resident software. Finally, Bammes worked with a programmer to terminate his personal TSR problems. He markets *PopDrop*, the fruit of that labor, for $19.95. *PopDrop* removes resident programs from memory. Other RAM-resident managers include *Referee* and a public-domain program *Mark/Release*.

Tony Middleton of Softronics, maker of a RAM-resident communications program called *Softerm*, comments that some of these programs "play off the user's fear of RAM-resident programs."

YOU'RE THE MEMORY MANAGER
Pop-up mania turns the user into the ultimate RAM-resident manager. RAM-resident programs require you to allocate memory not only for the RAM-resident programs themselves but for storage of the data they create. While you may wish to have a RAM-resident dictionary, thesaurus, and outliner working simultaneously, they won't help if you don't have enough memory left to save a document.

In the long run, expanded memory boards and future versions of DOS will solve the memory problem. Meanwhile, RAM resident software developers have implemented various temporary solutions. *SideKick* is available in different configurations. You choose the desk features you need, so you don't waste memory on accessories you won't use. *Spotlight*, another desktop accessory, leaves a portion of the program on the disk, making retrieval time slower but freeing memory. *Ready*,

an outline processor, can use memory on an expanded memory board.

APPLICATIONS ISSUES Some developers of applications programs have had to reassess their strategies to accommodate

■ Pop-up mania turns the user into the ultimate RAM-resident manager.

the RAM-resident issue. *Microsoft Word*, *XyWrite*, *SamnaWord*, and other programs use keyboard interrupts in much the same way as RAM-resident programs, but they don't pass the information along be-

cause they were designed to think they were the end of the line. To accommodate user requests, *XyWrite* is now available in two flavors: The new flavor supports RAM-resident compatibility by allowing you to disable the program's keyboard driver and rely on the BIOS keyboard routines. The old flavor does not.

Jim Edlin is in the process of revamping Bruce & James Software's *WordVision* software to accommodate RAM-resident programs—despite certain misgivings. "We are losing some of the fluidity of our program," laments Edlin. *WordVision* was one of the early leaders of the "take the keyboard and run" movement, which aimed to give users a more meaningful interface. Revamping *WordVision*, according to Edlin, means "compromising on all kinds of unpleasant issues . . . and returning to a much more vanilla keyboard driver."

For 4 years, software developers have

■ RAM RESIDENCY

tried to compensate for DOS's inability to
do multitasking by writing smarter (and
larger) background programs that contain
more and more information. The result,
according to David Rose, is "an ineffi-
cient situation, because each program has
to supply a duplicate of the intelligence."

During the past year, the RAM-resident
situation has begun to seem more than a lit-
tle out of control. A sense of despera-
tion—and of responsibility—has launched
several efforts to set industry standards to
eliminate the sources of RAM-resident
contention.

In May, Softronics, in cooperation with
Microsoft, sponsored the first RAM-resi-
dent conference in Colorado Springs.
More than 100 software developers attend-
ed to share information about a previously
proprietary subject: how they created their
RAM-resident software.

Softronics was prompted to organize
the conference when a major customer
asked the company to make *Softerm* com-
patible with the other four RAM-resident
programs that customer wanted to use. Af-
ter trying in vain to meet this request, Sof-
tronics established the conference to pro-
vide a forum for creating a set of rules that
would make memory-resident programs
get along with applications and with one
another.

If the momentum achieved at the con-
ference continues, we can expect to begin
to see so-called RAM-cram issues clear
up. Borland distributed demos of *MOM*.
Microsoft proposed some guidelines for
avoiding conflict between multiple RAM-
resident programs and promised to advise
developers with more information about
how DOS uses interrupts.

Softronics proposed a comprehensive
kernel solution that would extend DOS
and BIOS facilities and handle a full spec-
trum of RAM-resident requirements. While
the conference attendees approved
of the kernel solution, it seemed too big a
first bite. They agreed that the best place to
start was with the Interrupt 9 keyboard
call, the single worst serious offender. Da-
vid Rose of Rosesoft promised to contrib-
ute his work on the keyboard interrupt han-
dler as a starting point for a public-domain
interrupt handler. Roger Schafly of Bor-
land would collaborate with him on the
handler project.

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■ **RAM RESIDENCY**

■ Multitasking, partitioning, and operating environments such as *Windows* are all proposed replacements for RAM residents.

Before we are freed from the perils of RAM cram, standards must evolve to eliminate conflict between simultaneously acting programs, to define the loading order of these programs, and to allow us to free up memory by deinstalling resident programs. Of course, as Schafly emphasizes, these standards aren't worth much if they can't accommodate already existing software. No one is going to give up *Microsoft Word*, *WordStar*, or *XyWrite*.

NONRESIDENT SOLUTIONS Many industry observers look to other environments to replace RAM-resident programs entirely. Multitasking, partitioning, and operating environments such as *Windows* are all proposed replacements. *Windows*, *GEM*, and *TopView* present possible solutions, but these environments are guilty of many of the same types of offenses against DOS as RAM-resident programs themselves.

A new version of DOS with better background capabilities is in the offing. Some attendees at the RAM-resident conference feared that Microsoft, in an effort to push multitasking, might actually terminate the existence of the TSR call in DOS. DOS 5.0 will support multitasking, according to informed industry observers, but certain RAM-resident genres will undoubtedly survive a purge. Someday, perhaps, we'll fondly remember 1985 and 1986 as the years that briefly brought an unruly throng of pop-ups into our lives.
—**Robin Raskin**

Robin Raskin is a frequent contributor to PC Magazine.

HOW RAM-RESIDENT PROGRAMS WORK (AND DON'T WORK)

▼

*Two years ago,
RAM-resident programs
and pop-ups amazed
us with their agility
and magic and
fun. The party's over.*

Where did it all begin? Right here in this explanation of Interrupt 27h from the back of the PC-DOS 1.1 manual:

"Terminate but stay resident. This vector is used by programs that are to remain resident when COMMAND regains control. After initializing itself, the program must set DX to its last address plus one in the segment in which it is executing (the offset at which COMMAND can load other programs), then execute an INT 27h. COMMAND then considers the program as an extension of DOS, so the program is not overlaid when other programs are executed. This concept is very useful for loading programs such as user-written interrupt handlers that must remain resident."

I can remember the first time I read that paragraph in 1982 and thought: Wow! This is going to be some operating system.

Normally COMMAND.COM loads a program into memory and turns over control to it. When the program has finished (which may be a few seconds or several hours later), COMMAND.COM regains control and will use the same area of memory to load the next program you run.

If, however, a program terminates with Interrupt 27h, this is not the case. The program remains resident in memory because COMMAND.COM will load the next program *above* the memory of the resident program. For each successive remain-resident program, COMMAND.COM just keeps increasing the address where the next program will be loaded (see Figure 1).

While the DOS *Technical Information* manual told programmers how to use Interrupt 27h to create resident programs, it didn't tell them a whole lot else. For this concept to make sense, a resident program has to ensure that it regains control sometime in the future. Otherwise it would just sit in memory taking up space. To do this, the resident program must first cause a fundamental change in the inner workings of your PC.

INTERRUPT VECTORS You can't talk about resident programs without also talking about interrupts, because interrupts are the things that allow resident programs to be reactivated while other programs are running.

Hardware interrupts, generated by the hardware of the PC, are one type. They include Interrupt 8h (the h suffix stands for hexadecimal), which is the clock-timer-tick interrupt that occurs 18 times a second, and Interrupt 9h, which occurs every time you press or release a key on the keyboard. When one of these interrupts occurs, the microprocessor in your PC stops what it's doing, executes a quick routine (normally located in the ROM BIOS), and then returns to the program that was interrupted.

Software interrupts aren't interrupts in the same sense as the hardware interrupts. They are actually subroutines that carry out various chores and are invoked by programs themselves. Many of the software interrupt routines are in the PC's ROM

BIOS and allow programs to read keystrokes (Interrupt 16h), access the display (Interrupt 10h), or print something (Interrupt 17h). Other software interrupts are serviced by DOS rather than by the BIOS. A program invokes Interrupt 20h when it wants to terminate normally and uses Interrupt 27h to terminate but stay resident. Interrupt 21h provides about 100 different function calls that programs may use, most of them related to disk files.

Programs don't have to know exactly where these interrupt routines are located in memory because the addresses of all 256 possible interrupts are stored in an interrupt vector table in the bottom 1K byte of RAM in the PC. Because it's in random access memory, any program can change any of these addresses.

This is exactly what resident programs do before they terminate through Interrupt 27h. If a resident program needs to watch for keystrokes, it can get the current ad-

Figure 1: *When you load several RAM-resident programs successively, DOS simply increases the memory address at which it will load the next program.*

▲

dress of Interrupt 9h from the interrupt
vector table (initially pointing to a routine
in the ROM BIOS) and replace it with an
address pointing to itself. After the resi-
dent program intercepts Interrupt 9h, the
resident program, rather than the BIOS,
will get control when you press a key.

THE TICK OF THE TIMER Let's start
by looking at a type of resident program
that is relatively simple and generally reli-
able: a software print spooler. A print
spooler has to intercept two interrupts: In-
terrupt 17h, which most programs use to
print characters, and Interrupt 1Ch, which
is a timer-tick interrupt that itself is in-
voked by the BIOS Interrupt 8h routine.

Normally, as shown in Figure 2, an ap-
plications program simply uses Interrupt
17h to print each character. The routine in
the BIOS accesses the hardware to send
the character out to the printer. When a
software print spooler installs itself (see
Figure 3), the Interrupt 17h vector points
instead to a routine in the print spooler.
When the print spooler receives a request

Figure 3: *When a print buffer is installed and
an applications program uses Interrupt 17h,
the print buffer can store the characters in
memory. Then, by also intercepting the BIOS
"timer tick" Interrupt 1Ch, the print buffer
sends the characters to the BIOS while the
program does other work.*

Figure 2: *Normally, an applications program can send something to the printer by using Interrupt
17h. This invokes a routine in the ROM BIOS that controls the printer port hardware.*

to print a character, it simply stores the
character in memory set aside as a buffer
area.

The print spooler also has control of the
Interrupt 1Ch timer tick. Whenever it gets
an Interrupt 1Ch, the print spooler pulls
characters out of the spooler and sends
them to the printer by calling the *original*
Interrupt 17h routine in the BIOS. The
print spooler saved the address of this rou-
tine when it was first loaded.

If you use a serial printer, you probably
use the MODE program to redirect parallel
printer output to the serial port. Like the
print spooler, MODE is also a resident pro-
gram that intercepts Interrupt 17h.

Can MODE and this print spooler work
together to buffer printer output that even-
tually goes to the serial port? Only if you
loaded them in the right order. If you
loaded them in the right order. If you

The Issues of RAM Residency (continues)

Program/ Manufacturer	List price	Copy protected	Order of information loading	Removable from residence	Hot key	Hot key redefinable	Incompatibilities
Imcap, Version 1.3 Image Set Corp 555 19th St San Francisco, CA 94107 (415) 626-8366	$5.00	○	First	○	Shift-PrtSc	○	○
PopDrop, Version 1.0 Infostructures P.O. Box 32617 Tucson, AZ 85751 (602) 299-5062	$19.95	○	Any order	○	No hot key	N/A	○
Propel, Version 1.3 Dynamic Microprocessor Associates 545 Fifth Ave . #1103 New York, NY 10017 (212) 687-7115	$25.00	○	Any order	○	Alt-P	○	○
Save Our Spreadsheet (SOS), Version 1.0 ComData Computer Services Inc 2 Bryn Mawr Ave Bryn Mawr, PA 19010 (215) 525-1036	$29.95	○	Any order	○	Variable (but Alt-Del turns SOS off, Alt-Ins turns it back on)	●	○
Silent Partner, Version 1.0 Information Reduction Research 28 Ridgewood Rd Concord MA 01742 (617) 369-5779	$39.95	○	After RAM-disks and spoolers but before keyboard resident residents	●	No hot key	N/A	○
Cubit, Version 1.0 SoftLogic Solutions Inc 530 Chestnut St Manchester, NH 03101 (603) 644-5555	$49.95	●*	Any order	●	No hot key	N/A	○

○—Yes ○—No   N/A means not applicable   *Non-protected version available.

The Issues of RAM Residency

By whatever name—RAM resident, TSR (for terminate and stay resident), or pop-up—these "enhancement" programs often create more trouble than they save. PC Magazine Labs tested 30 common RAM residents, and it's easy to see from their diverse characteristics how problems can occur.

For example, some RAM-resident programs want to be loaded first, some prefer last, and others don't care. Obviously, not everybody can be first or last. You have to experiment by finding a loading order that works best.

It's usually necessary to remove RAM-resident programs in the reverse order from the one in which they are loaded. Hence, if you load a nonremovable program after a removable program, the removable program often cannot be removed. And, if you can remove it, it will leave a "hole" in memory that may not be usable by other applications.

Although some recent "RAM-resident managers" allow you to remove programs from memory, it's much better if the RAM-resident program can remove itself from memory, since it is the only program that really knows how to clean up after itself. Most RAM-resident programs cannot remove themselves from memory, and you have to reboot to get rid of them.

Many RAM-resident programs use a special key combination—called a "hot key"—that activates the program and in some cases pops it up to the display. Two RAM-resident programs that use the same hot key generally can't work together. Either the first or the two programs that you loaded will be locked out or both programs will pop up. If the hot key is redefinable, then you can avoid this problem.

Until multitasking and concurrent DOS become practical realities, users must arrive at their own solutions and compromises based on individual needs and preferences.

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the print spooler before MODE, Interrupt 17h points to code in MODE that sends the printer output to the serial port, completely bypassing the print spooler. But when MODE is loaded before the print spooler, Interrupt 17h will point to the print spooler program. The print spooler will then send printer output to the Interrupt 17h address that existed when it was loaded—the address in MODE—and MODE will send the output to the serial printer.

When using this hypothetical print spooler, you may experience a problem running certain programs: your printer will stop and not pick up again until you leave the program. These programs were probably written in BASIC and compiled with one of the older BASIC compilers that takes complete control of the timer-tick Interrupt 1Ch. The print spooler is relying on that interrupt and can't print without it.

So, the print spooler and MODE are compatible only when loaded in the right order, and the print spooler stops entirely when you run certain programs. Sounds like we're talking about resident programs, doesn't it? Moreover, print spoolers are an example of simple and reliable resident software. It gets worse.

THE HOT KEY Many resident programs play around with the keyboard. Often they define a special "hot key," which is the keystroke that activates the resident program so it can pop up to the screen.

Most major applications programs use Interrupt 16h for getting keystrokes. Interrupt 16h is a short routine in the BIOS that simply pulls the next keystroke out of a small buffer and hands it back. The keystroke gets into the buffer from the BIOS routine that services Interrupt 9h (the hardware keyboard interrupt).

A resident program can intercept Interrupt 16h and observe what keystrokes are being passed back. When Interrupt 16h is ready to pass back the "hot key," the resident program can pop up to the screen. But what if the keystroke used for the hot key is also used by the application? For instance, if you have installed a resident program that uses Alt-F10 as a hot key, and you also use a word processor that defines Alt-F10 to save a file, you could suddenly find yourself unable to save a file you had just finished editing.

■ RAM RESIDENCY

Most resident programs that use hot keys avoid this problem by intercepting Interrupt 9h instead of 16h. That way they can use "undefined" or "dead key" combinations that the normal BIOS Interrupt 9h handler ignores (such as Alt-?). Now the only problem is that the software manufacturer has to make sure not to use one of the same key combinations that's used by some other available resident programs.

That's the only problem? Not quite. By doing some of their own Interrupt 9h handling, resident programs have to start doing system-level (rather than application-level) chores. They have to make sure they properly reenable the 8259 interrupt controller, for instance, which is normally a system-level job. But most important, resident programs must "daisy-chain."

THE DAISY CHAIN When a resident program installs itself, it sets an interrupt vector address to point to its own code. But it must also retrieve the existing address of the interrupt routine and save it. When the resident program checks keystrokes for a hot key, it must call or jump to that saved address if the keystroke is not the hot key. In this way, all installed resident programs get to look at the keystroke in a long daisy chain that ends with the BIOS Interrupt 9h handler.

The last program installed has first dibs on each keystroke, so a conflict between two programs with the same hot key favors the program loaded later.

Keyboard macro programs work by intercepting both Interrupt 9h and Interrupt 16h. When certain defined keystrokes come through, they assign these keys a special code that they place in the keyboard buffer. When an applications program invokes Interrupt 16h to get a keystroke, the keyboard macro program substitutes the macro string for this special code.

Of course, if two or more programs are placing their own special codes in the keyboard buffer (and some pop-ups use this method also), then there are plenty of opportunities for collisions, interference, confusion, and uncertainty.

Let's say you load both a resident keyboard macro program and a resident text editor that you bring up with a hot key. Will the keyboard macros work in the

PC MAGAZINE — The Issues of RAM Residency (continues)

Product/ Manufacturer	List price	Copy protected	Order of program loading	Removable from residence	Hot key	Hot key removal	Stated incompatibilities
SmartKey, Version 5.1 Software Research Technology 3759 Wilshire Blvd., #211 Los Angeles, CA 90010 (213) 384-6120	$49.95	○	Last		K-Plus key (on keyboard)		
Software Carousel, Version 1.0 SoftLogic Solutions Inc. 530 Chestnut St Manchester NH 03101 (603) 644-5555	$49.95	●*	First		Alt-Spacebar		
Tornado Notes, Version 1.4 MicroLogic Corp PO Box 174 Hackensack, NJ 07602 (201) 342-6518	$49.95	○	Any order		Alt-J		
Whoops!, Version 3.0 Cornucopia Software Inc PO Box 6111 Albany, CA 94706 (415) 526-7000	$49.95	○	Any order		Alt-Right Shift Alt-Left Shift		Bit-mapped graphics programs
WindowDOS, Version 1.0 Software of the Future Inc. PO Box 531650 Grand Prairie, TX 75053 (800) 433-5355	$49.95	○	First		Ctrl-Ins		
Print Screen, Version 1A Domus Software Ltd 303 Waverly St Ottawa, Ontario Canada K2P 0V9 (613) 230-6285	$50.90	○	Any order		Shift-PrtSc		
Easyedit, Version 1.0 Polygon Software Corp 363 Seventh Ave New York, NY 10001 (212) 667-2424	$55.95	○	Any order		No hot key	N/A	
Homebase, Version 2.0 Brown Bag Software 2105 S. Bascom Ave., #164 Campbell, CA 95008 (800) 523-0764, (408) 559-4545	$69.95	○	Any order		Alt-Shift-H		
SuperKey, Version 111A Borland International Inc 4585 Scotts Valley Dr Scotts Valley, CA 95066 (408) 438-8400	$69.95	○	After non-Borland products but before Sidekick		Alt-Slash		
Webster's New World On-Line Thesaurus, Version 1.03 Computer Software Srv Simon & Schuster Inc 1230 Avenue of the Americas New York, NY 10020 (800) 624-0023	$69.95	○	Any order		Alt-F10		
Smart Notes, Version 1.0 Personics Corp 2352 Main St., Bldg 2 Concord, MA 01742 (617) 897-1575	$79.95	○	Any order		Ctrl-F6		Bit-mapped graphics programs
SideKick, Version 1.56A Borland International Inc 4585 Scotts Valley Dr Scotts Valley, CA 95066 (408) 438-8400	$84.95	●*	Last		Ctrl-Alt		

● = Yes ○ = No N/A means not applicable. *Non-protected version available.

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Back

1. Follow instructions on the other side

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PC MAGAZINE — The Issues of RAM Residency (continued)

Program/Manufacturer	List price	Copy protected	Order of program loading	Removable from residence	Hot key	Hot key redefinable	Stated incompatibilities
Get!, Version 1.02 Cygnet Technologies Inc 1296 Lawrence Station Rd Sunnyvale, CA 94089 (800) 621-4292, (600) 331-0113 (in Calif.)	$89.95	○	Last	●	Alt-G	○	DESQview
Keyworks, Version 2.0 Alpha Software Corp 30 B St Burlington, MA 01803 (617) 229-2924	$89.95	○	Any order	●	Plus key (on keyboard)	●	**
Beckcomm, Version 1.3 LaSalle Micro Inc 1350 Remington Rd Schaumburg, IL 60195 (312) 882-5171	$95.00	○	Last	●	Alt-Break	●	Color some- times dis- appears
Ready!, Version 1.0 Living Videotext Inc 2432 Charleston Rd Mountain View, CA 94043 (415) 964-6300	$99.95	○	Any order	●	Ctrl-5	○	
Turbo Lightning, Version 1 01A Borland International Inc 4585 Scotts Valley Dr Scotts Valley, CA 95066 (408) 438-6400	$99.95	○	Last	●	Shift-F8	●	After non- Borland products and SuperKey but before SideKick
Sidekick, Version 1.0 Lattice Inc 22 W 500 Butterfield Rd Glen Ellyn, IL 60137 (312) 858-7950	$119.95	○	First	●	Alt-Shift	●	
Backtrack, Version 1.7 Tallgrass Technologies 11100 W 82nd St Overland Park, KS 66214 (913) 492-6002	$129.00	●	First	●	No hot key	N/A	DoubleDOS
Pop-Up Desk Set Plus, Version 1.5 Popular Programs Inc 135 Lake St, #160 Kirkland, WA 98033 (800) 44-POP-UP, (206) 822-7065	$129.95	○	Last	●	Alt-Key combination	●	
ProKey, Version 4 00 Rosesoft Inc 4710 University Way NE Seattle, WA 96105 (206) 282-0454	$130.00	○	First	●	Alt-Slash	●	
Inset, Version 1.0 American Programmers Guild Ltd 12 Mill Pond Rd Danbury, CT 06811 (203) 794-0396	$149.00	○	Any order	●	Shift-PrtSc‡	○	Allows for stated incompat- ibilities
Print Merge, Version 1.0 Polaris Software 310 Via Vera Cruz, #205 San Marcos, CA 92069 (800) 338-5943, (619) 471-0022	$149.00	●	First	●	Shift-PrtSc	○	
Productivity Plus (PRD+), Version 1.4 Productivity Software International 1220 Broadway New York, NY 10001 (212) 967-8666	$199.95	○	First	●	Alt-Esc	●	Other key- board pro- grams

● = Yes ○ = No N/A means not applicable **Programs that load into an absolute location in RAM or Inset keyworks in a nonstandard way ‡Hot key cannot be redefined for PopAny, PopDate, and PopDOS modules †For Lotus's 1-2-3, Alt-PrtSc. ◊Offers predefined alternatives.

editor? It depends. If the text editor gets keystrokes by calling Interrupt 16h, then the macros will probably work. But there's a second method. The resident text editor could get keystroke information not by issuing an Interrupt 16h directly, but by calling the address of Interrupt 16h routine that it retrieved from the interrupt vector table when it was first loaded. In this case the macros will work only if the macro program was loaded before the text editor program.

But what if the text editor gets keystrokes by using Interrupt 9h? If the editor takes over Interrupt 9h completely for this, the keyboard macro program will have no effect, because it's not in the chain. Nor will the keyboard macro program work if it has been loaded before the editor. In other cases, the keyboard macro program may think it's working, but it won't be. If you press one of the macro keys, nothing will happen. Yet.

Now you leave the text editor and go back to an application. What suddenly appears on your screen? A macro from the keyboard macro program pulled out through Interrupt 16h calls from the application. Does it sound confusing and crazy? You bet it does.

THE XYWRITE PROBLEM Although most large applications programs get keyboard information from Interrupt 16h, there is nothing to prevent an application from using Interrupt 9h for keyboard information. It's not easy, but it allows the program to define every conceivable type of keyboard combination.

When an applications program uses Interrupt 9h to do its own keyboard processing, it doesn't need to daisy-chain. But because it doesn't daisy-chain, it disables all the hot keys of resident programs: Interrupt 9h begins and ends in the application program. Probably the most famous program that does its own keyboard processing is the *XyWrite II* word processor (*XyWrite III* allows a way around the problem), but some communications programs (Hayes's *Smartcom*, for instance) also do it.

SideKick got around the *XyWrite* problem in a manner that is both clever and sleazy. Aside from intercepting Interrupt 9h (and a bunch of other interrupts), *Side-*

THE SOLUTIONS TO RAM-RESIDENT PROBLEMS (A PERSONAL VIEW)

It's no use talking behind the operating system's back. Try experimenting with a more radical solution to the problem.

As I was completing my article on the inner workings of RAM-resident programs, I thought perhaps I was being a little too harsh with them. I considered toning down my conclusions a bit until I got a call from an old friend on a PC-related problem. A coworker of his had lost three files in quick succession using a well-known applications program. As my friend described in detail what had happened, I was puzzled. I was familiar with the applications program and couldn't believe that it was exhibiting such strange behavior.

Finally he said, "Oh, by the way, we've been using a RAM-resident program with the application. That couldn't be causing any problems, could it?"

THE USUAL SUSPECTS If you're a heavy user of RAM-resident programs, you know what you have to do when something in your PC starts acting funny. You round up the usual suspects and remove them one by one from your AUTOEXEC.BAT file until the problem goes away. Then you spend some time rearranging the loading order of the RAM-resident programs until they work a little better. They never work flawlessly, of course.

Some users of RAM-resident programs have even grown accustomed to having their PCs crash or freeze up several times a day. They think it's normal. It's not.

Several solutions have been proposed for eliminating the problems associated with RAM-resident programs. In Stephen Davis's article, "When your Pop-ups Need a Manager," you'll read about "RAM-resident managers." These are programs (RAM-resident, of course) that manage other RAM-resident programs. I'm skeptical. I believe in these programs about as much as I believe that the "save paper" memoranda frequently distributed in large bureaucracies really help to save paper.

Relying upon RAM-resident programs to handle program scheduling, data transfer, and screen management is simply unrealistic. These are jobs that only an operating system can do properly. None of the proposed solutions to the RAM-resident problem (programming guidelines, RAM-resident managers, a kernel that helps out RAM-resident programs) can work because RAM-resident programs will continue to operate behind the back of the operating system.

Recently, I've been experimenting with a radical solution to the RAM-resident problem. I've simply stopped using them. I've found I don't really miss them all that much and that I actually prefer using a machine where nothing jumps out and surprises me. The hard part is convincing yourself that it's really OK to keep a calculator and notepad on your desk next to your PC.

Many RAM-resident programs are not the only productivity helpers. Efficient PC use also involves good subdirectory organization, the use of batch files, and knowing the full capabilities of your applications programs.

Tossing out RAM-resident programs also means facing up to the sad but inevitable truth that current versions of DOS are simply unequipped to handle more than one application at a time.

THE WINDOWS SOLUTION Of course, my solution to the RAM-resident problem can hardly be acceptable to software developers of these programs. Neither is the solution of waiting until we have an operating system (Microsoft's long-overdue "protected-mode DOS," for instance) that can handle multiple applications. First, protected-mode DOS will run only on the AT, and second, it will probably not allow many of the tricks RAM-resident programs currently use in order to run successfully.

Software developers can best demonstrate their commitment to the future of the PC by taking a good hard look at *Microsoft Windows. Windows* is the most viable solution, not only to the RAM-resident problem, but to many other problems as well. *Windows* has been carefully thought out and designed with a real eye toward the future and the capabilities of more-advanced processors, displays, and input devices. *Windows* takes care of the multitasking, scheduling, and switching among programs as well as data transfer between applications.

I don't want to see manufacturers of RAM-resident programs go out of business. I want to see them port their stuff to an operating environment where the programs can exist more amiably with others. *Windows* is it.—**Charles Petzold**

Kick also intercepts the Interrupt 8h timer tick. Every time an Interrupt 8h occurs (18 times a second), *SideKick* will check to see if Interrupt 9h is still pointing to itself or if another program (such as *XyWrite*) has taken it. If another program has taken Interrupt 9h, *SideKick* will grab it back and daisy-chain to the program that usurped it. This is a tricky maneuver and does what it's supposed to do: *SideKick* is always first in the keyboard daisy chain and always gets first dibs on the keystrokes.

But imagine if other resident programs starting doing the same thing. Eighteen times a second, all these resident programs would attempt to make themselves the first program in the daisy chain. Eighteen times a second, the last-loaded program using this technique would still end up as the first one in the chain because it would also be the first program in the Interrupt 8h chain.

So, maybe one of these resident programs could start using other interrupts to check if it is also the first program in the Interrupt 8h chain. If not, it could put itself first in line on Interrupt 8h so it can then get first in line for Interrupt 9h. It could detect the other resident program (or programs) attempting to be first and push them out of line, rearranging the daisy chain to bypass them entirely. What is this, a computer or a playground?

Fortunately, no other resident program (to my knowledge) has done what *SideKick* has done. Borland's position is that *SideKick* alone should be allowed to make itself first in the daisy chain because *SideKick* users have come to expect *SideKick* to work where other resident programs cannot. When Borland's Roger Schafly spoke about this to other resident program developers at the Softronics RAM-resident conference, he elicited the only sustained audience outburst of displeasure at the 2-day conference.

But what Borland has done works. It lets *XyWrite* users bring up *SideKick*.

WHAT YOU SEE IS ... Handling the display is one of the biggest problems for pop-up programs. When a pop-up is invoked, it must save the contents of the display (or part of it) in its own memory and then display itself on the screen. When it leaves, it has to restore the screen to its original state by writing back out the part that it saved.

That sounds simple enough, and in many cases it is. However, some programs (*Microsoft Word*, for instance) work in a graphics mode. Popping up onto a graphics display is more difficult. First, the pop-up area has four to seven times more data per character (depending on the video adapter), so the resident program must reserve more space to hold it all. It must read and restore this data in terms of dots rather than characters.

The resident program can't directly display itself on the graphics screen without also converting all its characters to dots. It could let the BIOS do this job, but the BIOS is very slow. Then it wouldn't be a pop-up. It would be a drip-down.

Another approach is that the resident program could switch the display to a character mode, pop up, and then restore the

screen back to the graphics mode when it's done. The safest way to change the video mode is to let the BIOS do it, but the PC BIOS erases the contents of video memory when it changes modes. This erasure means that the resident program has to save the entire contents of video memory (16K bytes in the case of the Color/Graphics Adapter).

Or, the resident program could change the video mode directly by accessing the 6845 video controller on the Color/Graphics Adapter. That way it doesn't have to save any part of video memory except that which it uses for its own display. This is what *SideKick* does when it pops up on a

■ When a pop-up is
invoked, it must save
the contents of the
display in its own
memory and then display
itself on the screen.

graphics display, and this is why the rest of the screen (except for *SideKick*'s window) suddenly becomes a mess of ugly random characters.

Apart from the ugliness of the rest of the display, the method works—provided you have a normal Color/Graphics Adapter. But what about the Enhanced Graphics Adapter (EGA)? If the pop-up program tries to directly access the 6845 video controller on the EGA, it has a problem because the EGA doesn't have a 6845, and what it does have is not directly compatible. Your screen will go berserk and you won't be able to read anything. The Hercules Graphics Card is another problem. Pop-up programs cannot even determine whether the board is using a text or graphics mode.

Even in text modes, a pop-up can still run into problems. An applications program can choose to control the hardware of the 6845 video controller directly. For instance, it could use video paging by pro-

gramming different "starting addresses" in the video controller registers. But the video controller registers are "write-only," hence a pop-up program has no way to determine which part of video memory is actually being displayed. It could pop up to an area of video memory that is not visible. It would appear as if the hot key didn't work, but the program underneath would suddenly stop working. If the resident program tries to circumvent these problems by resetting the 6845 controller to a normal state, then it cannot return the display to its former state. The information is simply not accessible.

BREAKING THE RULES Almost everyone agrees that it's not a good idea to directly access the video controller. Using BIOS routines instead helps future compatibility with new types of video adapters. But for both the display and the keyboard, resident programs are almost forced to directly access the hardware. Moreover, they only work right if application programs are *not* using the hardware.
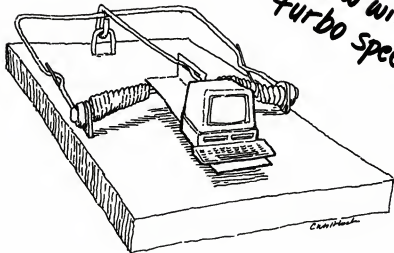
Is this right? Should resident programs be allowed to break the "rules" of proper PC programming while requiring that applications programs follow these same rules? Must applications programmers actually try to make it easier for pop-ups to exist by giving up the flexibility and power inherent in directly controlling the hardware? And who's in charge here, anyway? Where is DOS in all this mess? Shouldn't DOS be helping out?

Aside from letting programs remain resident in the first place, DOS is really unnecessary for most functions. Many resident programs and large applications programs bypass DOS entirely when using the keyboard, display, timer, and printer. They must deal with DOS for only one essential chore: only DOS is qualified to manage file I/O.

FILE THIS, PLEASE For those resident programs that need to use files, it certainly seems simple enough. Just use normal DOS Interrupt 21h calls from within the resident program. It works—most of the time, anyway. But it certainly doesn't work all the time, because of a simple little problem: DOS is nonreentrant.

What this term means is that a resident

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program cannot make a call to DOS while an applications program is also making a call to DOS. Let's take an example. You're using an applications program that makes a call to DOS to store a file. DOS switches to an internal stack where it stores important information such as return addresses for subroutine calls. In the middle of this, you hit the hot key for a resident program. This move suspends the first DOS call while the resident program reads the keystroke and pops up to the screen. If this resident program must also make a DOS call, that call will probably work all right. It returns control to the application, which is still in the middle of the DOS call—but the stack data now contains stuff from the resident program's DOS call. Result? Crash. Can the disk data be damaged? Yes, it's possible.

One way around this is to have the resident program intercept Interrupt 21h so it can determine if DOS calls are in progress. If so, it can refuse to be activated because it cannot use the disk.

This method is not entirely satisfactory because whenever your cursor is sitting on the DOS prompt, COMMAND.COM is in the middle of a DOS Function Call 0Ah to read your keystrokes. Does this circumstance prevent a resident program from using the disk while you're sitting on the DOS prompt? No, it doesn't. It's insane that you can run any other program from the DOS prompt, but you can't activate the pop-up.

Well, then let's have the resident program also look out for Function Call 0Ah, and if that comes along, we won't let DOS do it quite yet. That way, if the user hits the hot key, the resident program can pop up, and if the user hits some other key, we can just let the DOS function call proceed. Simple enough. Some resident programs still use this method with varying degrees of success.

THE DOS 2.0 CHANGES In 1983, when Version 2.0 of DOS was released, programmers of resident programs found two interesting changes in the new DOS. First, a new "terminate but stay resident" function call was added. Unlike the earlier Interrupt 27h, the new function call allowed resident programs to be larger than 64K bytes.

Also in DOS 2.0 was something quite

amazing—a resident program called PRINT. For most people, PRINT.COM was just a funny type of background print buffer that could only print things that were stored in files on the disk. For programmers who had wrestled with the DOS nonreentry problem, PRINT.COM was a feat of magic. PRINT was a resident program that accessed files.

How did it do it? Armed with DEBUG, programmers searched inside PRINT .COM and discovered some unusual things. PRINT.COM contained routines that intercepted Interrupts 28h and 2Fh. It also seemed to use the DOS Function Call 34h for some important function. These

■ *From a technical perspective, RAM-resident programs work mostly through unstable tricks and dirty kludges.*

were all new things. Here's what the Technical Information appendix in the DOS 2.0 manual says about these three items: "Used internally by DOS." In other words: undocumented. In other words: "We know how to get around the nonreentry problem, but we're not telling you."

Imagine steam coming out of the ears of thousands of programmers. Imagine these programmers spending countless hours with disassembled listings of DOS and PRINT.COM, attempting to determine how these things worked.

Interrupt 28h has come to be known in the DOS underground as the "DOS scheduler." It sounds like a multitasking interrupt, but it's not. It's just a kludgey and complex method to let PRINT.COM do some file I/O.

Interrupt 28h still doesn't let resident programs get around the DOS reentry problem in all cases. If you have a resident program that does file I/O, try this: Do a TYPE command for a fairly large file. In

the middle of the TYPE command, try to pop up the resident program and make it access a file. Hope it refuses to do so because if it does try to access it, you'll have to reboot soon.

Here's another way to test out the skill of a resident program in dealing with the DOS nonreentry problem: Do something that causes an "Abort, Retry, Ignore" message (for instance, a DIR command on an empty disk drive). Before responding, try to bring up the resident program to do some file I/O. For more fun, see what happens when a resident program tries to do some file I/O on an empty disk drive.

These are some of the tricky areas where many resident programs still cannot fully deal with the DOS nonreentry problem. If you're on a local area network, you probably already know which resident programs will crash your system and which resident programs will crash the entire network. You may have noticed that the documentation for PRINT.COM in the DOS 3.1 manual says it can't be used on a network server. Will other programs that use the Interrupt 28h "scheduler" also not work on networks?

Because Interrupt 28h is not documented, such things are not quite clear. Think of the lack of information this way: Interrupt 28h has one less paragraph of documentation than the original Interrupt 27h.

THE BROADER PERSPECTIVE The way I've described how resident programs work, it may seem as if a PC loaded with resident programs is a free-for-all that often degenerates into madness, that there's a war going on inside your machine, and that a resident program is something you'd want to avoid on the streets, much less invite into your home to live in your PC. This is true.

Any technical overview that discusses the inner workings of resident programs has an obligation to tell you that from a technical perspective, resident programs work mostly through unstable tricks and dirty kludges. As someone who has written many resident programs (some of them appearing in *PC Magazine*'s Programming/Utilities column), I can tell you this from experience.

As Robin Raskin noted in her introduction, manufacturers of resident programs

must extensively check for peaceful coexistence with other resident and nonresident programs. It's gotten to the point where even manufacturers of normal software have to test for compatibility with resident programs. This very fact indicates that something is inherently rotten in the whole

■ What we need, of course, is the future multitasking version of DOS to permit coexistence without chaos.

scheme. In what other operating system—multitasking or not—is software coexistence a problem?

Resident programs have taken over many of the scheduling and system-level chores normally handled by an operating system, but without also taking over any of the responsibilities. In doing so, they subvert the integrity and reliability of DOS and every program running on your PC. DOS is not yet a multitasking operating system. It cannot maintain stability in your PC if resident programs insist on treating it like one.

Yet, resident programs are in many ways useful. They aid productivity. Sometimes they are almost essential. What we need, of course, is the future multitasking version of DOS to permit coexistence without chaos and resolve the conflict between utility and reliability. Meanwhile, the direction that Microsoft has taken with Windows (see sidebar "The Solutions to RAM-Resident Problems") shows how an operating environment can allow multiple programs to peacefully coexist, to share system resources, to be immediately available, and to pass data among themselves.—Charles Petzold

Charles Petzold is a contributing editor of PC Magazine.

THE RAM-RESIDENCY HORROR SHOW

All too often, when a RAM-resident pop-up program exits a display in graphics mode, garbage enters.

Video displays present special problems for RAM-resident pop-up programs. Pop-ups must be intimately familiar with the hardware of the video adapter to pop up quickly to the display. Yet pop-ups do not have the luxury accorded to applications programs of simply resetting the video mode and clearing the screen when they exit. On exit, pop-ups must restore the display to its previous state.

In text modes, this is not very difficult. In graphics modes, it's a nightmare. A pop-up cannot preserve a large chunk of a graphics display image without using a lot of memory space. It therefore has to reprogram the video adapter to use it more easily. But the previous state of the video adapter is simply not accessible through its software, so in many cases a pop-up has to guess how the video adapter was configured in order to restore it.

We tested all the RAM-resident programs listed in the table entitled "The Issues of RAM Residency" for their ability to pop up on a 1-2-3 graphics display. The tests were run on three standard video adapters—the IBM Color/Graphics Adapter, the Hercules Graphics Card, and the IBM Enhanced Graphics Adapter. Several examples of the results are shown in the screen shots.

Ideally, a pop-up program should preserve the existing graphics image in the background of the display when it pops up, then restore the section it displaced when it exits. Moreover, the pop-up should at least be able to do this for the three standard graphics adapters.

None of the programs came anywhere close. Some of them refused to pop up. Some of them froze. And many of them

Screen shot 1: The SideKick menu on top of a 1-2-3 graph on a Color/Graphics Adapter.

Screen shot 2: The result when a pop-up program does not recognize a graphics mode.

Screen shot 3: A 1-2-3 graph on an Enhanced Graphics Adapter after the pop-up program exits.

created some really ugly screens.

Screen shot 1 shows the familiar *Side-Kick* menu when popped up on top of a *1-2-3* graph on a Color/Graphics Adapter. *SideKick* first switched the display to a text mode, then rendered the rest of the display almost unrecognizable. The scattered boxes, lines, and odd characters are actually bit-mapped graphics data now being interpreted as text characters and attributes.

While this is not the most preferable approach, it's certainly not the worst. Some RAM-resident programs do not recognize that the display is in a graphics mode. Screen shot 2 shows one typical result. The *1-2-3* graph is visible, but what's that garbage across the top? The pop-up is writing text-mode characters and attributes to the display, but the display is in a graphics mode. The adapter interprets the pop-up display as bit-mapped graphics data. If you can't remember how to exit the pop-up, you might be forced to reboot.

Once the pop-up leaves the screen, it completely restores the graph to its initial state . . . in most cases. Although the Enhanced Graphics Adapter has been around for 2 years, it still presents some problems for pop-ups. Screen shot 3 shows a *1-2-3* graph on an Enhanced Graphics Adapter *after* the pop-up exits. The dots across the top are garbage that the pop-up left behind.

So much for the video adapters that have been around for years—the ones that programmers have had plenty of time to get to know.

The forthcoming advent of low-cost, high-resolution video boards with sophisticated graphics processors will create even more problems for pop-ups. These boards will most likely have IBM-compatibility modes, so that if an applications program does not know how to use the advanced video modes of an adapter, it will simply use a compatibility mode. But the compatibility mode will not help programmers much. For a RAM-resident program to have complete usefulness, it must be able to pop up on an applications program that uses *all* the video modes.—**Charles Petzold**

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WHEN YOUR POP-UPS NEED A MANAGER

▼

If RAM-resident programs are creating chaos in your PC, maybe you need a manager—a RAM-resident utility that can remove other pop-ups from memory, make them dormant, or let normal applications be resident.

The past year has seen literally hundreds of RAM-resident programs pop into action, enabling PC users to call up utilities ranging from calendars to auto-dialers at the touch of a key. Their purpose is to enhance productivity—to help users work better and smarter by letting them perform more than one task at a time. But when many programs are installed in RAM, they compete with one another for chunks of memory and for keyboard control, sometimes creating utter chaos.

The abundance of RAM-resident programs and the ensuing problems have spawned a new software category. Several new software packages have begun to appear on the market to help "manage" these utilities or to permit "normal" programs to offer the advantages of RAM residency.

Three of the resident-program managers examined here help you control your RAM-resident programs by permitting you to remove them from memory or make them dormant. (Ironically, most of them don't let you remove themselves from memory, a process known as "uninstalling." And while some can change their "hot keys" to avoid conflicts, most cannot.)

The other two resident-program managers allow normal programs to be made RAM resident themselves. They let you avoid buying and learning separate RAM-resident programs by converting your existing utilities into pop-ups.

Mark/Release

Sometimes all you must do to find an answer to your problem is ask. The *Mark/Release* RAM-resident-program manager is available in the public domain for the price of a floppy disk plus copying fee or the cost of a phone call to a remote bulletin board system. The name of the package may differ from one source to another, but all of them were written by Kim Kokkonen. I downloaded from a bulletin board a file called *TSR.ARC*, which contained Version 1.9 of the program, dated May 22, 1986.

Most RAM-resident programs offer no means of uninstalling themselves to let you recover the memory they occupy, short of rebooting the system. *Mark* and *Release* are a pair of utilities that work in tandem to add this capability to all RAM-resident programs. Before installing any other utilities, and as often as you like thereafter, you can run *Mark*. Itself a RAM-resident program, *Mark* uses 1,600 bytes of memory to memorize the current state of the system, including extended memory. (Note: Version 2.1 of *Mark/Release*, which was not available in time for review, promises to provide the option of saving *Mark*'s data to disk, using only a scant 150 bytes of RAM for each run.)

Executing *Release* restores the system back to its state before *Mark* was last executed, effectively removing any RAM-resident programs installed thereafter, including *Mark* itself. Entering *Release* several times backs the system up to each previous invocation of *Mark*. One option is to assign a name for each time you invoke *Mark*. If you run Release with the same name, you restore the system back to that particular invocation of *Mark*.

An additional utility in the package, Mapmem, tells you the names and memory allocated to the installed RAM-resident programs. Mapmem shows each RAM-resident program, including the amount of memory occupied, the interrupt vectors hooked and other technical information. Just knowing how much memory each utility uses is enough to make Mapmem worthwhile, even without the other information. Mapmem also shows the position and name, if available, of each installation of *Mark*.

The other programs included in the package are somewhat less useful. RAM-free rapidly displays the amount of RAM remaining. Of course, this same information is available from CHKDSK, if you don't mind waiting awhile for it. The utility Eatmem uses up RAM. Although this certainly doesn't sound all that useful, developers working on RAM-resident programs of their own sometimes need just this ability. However, the average user does not. As with all public-domain programs, no printed manual is available, but the documentation file present on the distribution disk does a thorough job of explaining all of the programs.

Like any true public-domain program, *Mark/Release* is available free for non-commercial use. (Commercial users must contact Kokkonen.) *Mark/Release* is distributed by TurboPower Software, which first wrote the utilities to aid in the development of its *TurboPower Utilities*. Turbo-Power Software hopes *Mark/Release* will interest potential customers in its products.

Mark/Release represents a simple, no-frills package that simply works without a hitch. And you can't beat the price.

PopDrop

Infustructures' *PopDrop, The Memory Management Utility*, is functionally similar to the public-domain *Mark/Release*. Like *Mark/Release*, *PopDrop* lets you install RAM-resident programs, reclaiming their memory.

PopDrop comes with a manual that, though short, adequately covers program use. The distribution disk contains an extensive tutorial, which describes not only how *PopDrop* works but explains in some detail how DOS manages RAM memory. This aspect of the tutorial alone might justify *PopDrop*'s cost to unsophisticated PC users.

Unlike *Mark/Release*, *PopDrop* is one program, containing both the functions found in *Mark* and *Release*. In addition, *PopDrop* has a View function, which displays each layer of installed programs between invocations of *PopDrop*, rather than relying on a separate mapping program.

The amount of RAM dedicated to each layer is displayed along with the names of the installed programs, if DOS 3.0 or later is used. Unfortunately, the technical information available from *Mark/Release*'s Mapmem is missing from the View command.

Why should anyone pay for a program, when similar software is legally available at no cost? Other than the excellent tutorial, there is little to differentiate the current version of this product from the public-domain *Mark/Release*. On the other hand, the modest price tag should scare no one away and since it is a commercial product, Infustructures has a commitment to support *PopDrop*. Indeed, when a subtle bug was found in the original release of Version 2.0, Infustructures corrected the problem and shipped new disks to owners of the defective software, free of charge. *PopDrop* lived up to its advertised claims and would be a useful addition to anyone's system disk.

Referee

Like *Mark/Release* and *PopDrop*, Persoft's *Referee* package lets you unload RAM-resident programs. *Referee* goes beyond these simple packages, adding the ability to disable and later enable RAM-resident programs, as well as create something Persoft calls RAMTeams. All of these functions are implemented from easy-to-use menus. You can also access *Referee* from within applications software, as well as from the DOS prompt.

You install *Referee* by executing the program Refwatch, and, as with the other resident managers, it should be installed before any other RAM-resident programs. Refwatch uses 22.5K bytes of RAM. It cannot unload programs installed in the CONFIG.SYS file during boot-up; neither can any of the other managers. Unlike the other packages, however, you never need to load Refwatch more than once. It watches the installation of each subsequent RAM-resident program, memorizing details about each utility.

With Refwatch loaded, you execute *Referee* from the DOS prompt. *Referee* defines any unknown installed utilities by their "execution name"; however, by selecting the proper menu option, you may

assign descriptive names to any or all utilities. For example, like SideKick initially appeared in *Referee*'s menus as SK.COM, but that was easily replaced with the more descriptive name SideKick. This descriptive data is saved to disk and reloaded at bootup.

Referee can unload RAM-resident programs, reclaiming their RAM for use by other programs. The unloaded programs are not lumped together in layers; the name of each utility appears in the main menu. You unload a particular utility by moving the cursor to the desired name and pressing the Alt-U key combination. As with *Mark/Release* and *PopDrop*, if any given utility is uninstalled, any utilities installed after it are automatically removed. Any utilities installed after Refwatch may be removed from memory. Refwatch itself cannot be removed.

Besides unloading RAM-resident programs, *Referee* lets you simply deactivate a particular utility. When you put the cursor on the name of a particular utility and enter Alt-D, that utility becomes dormant. The effect is the same as if it were unloaded except that its memory is not restored for use by other programs. You can reactivate a deactivated utility by putting the cursor on it and entering Alt-A. You can deactivate a single utility without deactivating all of the RAM-resident programs loaded after it.

This function is particularly useful when a clash occurs between two RAM-resident programs or between a RAM-resident program and an applications program. For ex-

■ RAM RESIDENCY

ample, one of my favorite utilities uses the key combination Alt-F10 as its startup "hot key." Unfortunately, my favorite word processor assigns a function of its own to Alt-F10. Invariably, whenever I enter the word processor Alt-F10 command, the resident utility pops up instead.

With *Referee*, all I need do is simply de-activate the utility. I am now free to enter the word processor Alt-F10 command. Both of these incompatible RAM-resident programs can live peaceably within my system. As long as they are not both activated at the same time, neither is aware of the other's existence.

To facilitate this process in *Referee*, you can define what Persoft calls RAM-Teams. For example, I instructed *Referee* that any time I load the word processor I wanted the conflicting utility automatically deactivated. I further instructed that I wanted the utility reactivated whenever I exited the word processor. This RAM-Team is saved to disk, along with any other teams I care to define. The problem is now solved: whenever I enter Alt-F10 within the word processor, the key is passed to the applications program; any other time, it is handled by the RAM-resident program. Furthermore, with RAM-Teams at work for me, I can even ignore *Referee* itself because it quietly smooths out these little problems.

By pointing at a resident program in the menu and entering return, *Referee* displays the utility's status, name, and memory use. This information is helpful in deciding whether to unload a particular utility. The technical information that *Mark/Release* supplies is not available.

The activate and deactivate functions are also available from a RAM-resident version of *Referee* known as *Sideline*. *Sideline* can be installed any time after Refwatch and can itself be unloaded from *Referee*. *Sideline* uses 12K bytes of memory. To avoid possible conflict, the hot key used to enter *Sideline* can be changed to any Alt, Shift, or Ctrl key you like.

The manual provided with *Referee* is quite thorough and includes a trouble-shooting guide. With *Referee*'s menu-driven operation, however, the manual should rarely be necessary. Although still not inexpensive, *Referee*'s price is higher than the other resident-programs managers

tested. But if the simpler *PopDrop* or *Mark/Release* do not provide the functions you need, *Referee* may be just the program to keep your RAM-resident programs living together in peace.

Resident

Resident, the memory-resident system from Information Software, takes normal, nonresident applications programs and turns them into RAM-resident pop-ups.

To install a program you must have RESIDENT.COM, COMMAND.COM, and the program to be installed. They need not all be on the same floppy disk or the same directory of a hard disk, but they must all be accessible without changing floppies. You must then decide what "hot key" you want to use, combined with Shift-Alt, to bring up the application once loaded. The letters of the alphabet and the numbers 0 through 9 are all legal, so it's easiest to remember if you just use the first letter of the application. For example, 1 is a logical choice for *1-2-3* or *W* for *WordStar*.

Finally, you must decide how much memory to reserve for the applications program. Unfortunately, the amount of memory an application uses is not usually obvious. Information Software includes an extensive table in the manual to help you decide. The same list is included as a file on the distribution disk, which is more convenient than referring to the manual. If your favorite application does not appear in the list, Information Software gives some rules of thumb for deciding how much memory to allocate, but you will still

have to resort to trial and error.

Since the list of applications programs provided is fairly exhaustive, let's use *1-2-3* as an example. By looking up *1-2-3*, Release 1A, in the directory, I found that the program uses 150K bytes of memory. (It was not at all clear how big a spreadsheet I could create within my paltry 150K.) To install, you enter the command: RESIDENT 1,150, 1-2-3. To enter

1-2-3 at any time thereafter, hit Shift-Alt-1. Lotus's *1-2-3* instantly pops up. Entering Shift-Alt instantly pops you back to the original application.

Information Software claims that 26 different applications can be loaded at one time, but since these applications must all reside within 640K bytes, the actual limit is much smaller. *Resident* uses a scant 12K bytes of memory for each application in-

■ *Resident*, from Information Software, takes normal, nonresident applications programs and turns them into RAM-resident pop-ups.

stalled, in addition to the memory requirements of the application itself. This is perhaps the only fly in the ointment. RAM-resident programs are written to use memory as efficiently as possible. Normal programs, however, often require large blocks of memory to be reserved by *Resident*. To make *WordStar 2000* resident, for example, you will need to set aside 256K bytes of precious RAM.

Fortunately, applications that have been made resident with *Resident* can be removed from memory with the Remove utility on the distribution disk. Entering Remove at the DOS prompt removes the last application installed. By repeatedly entering REMOVE, all system memory gobbled up by *Resident* can be reclaimed.

Also included on the distribution disk are CutPaste, NotePad, and DeskTop. CutPaste and NotePad are more or less conventional RAM-resident programs. Installing CutPaste before using any programs resident allows information to be cut from one and pasted into another. Cut-Paste also works with the currently running application. NotePad is a RAM-resident editor program. Although nothing to get excited about, both programs were pleasant to use.

DeskTop is a normal applications program that can be made resident. The BASIC source code for DeskTop is included with the executable .EXE file. I assume that DeskTop is included as only an example. It has a simple calculator, decimal conversion, ASCII table, telephone message taker, and a terminal program. Unfortunately, DeskTop is not a sophisticated program and does not handle errors well. It does not give you enough for the 110K bytes of memory it requires.

CHKDSK showed 597,520 bytes available on my 640K-byte system after booting up DOS 3.1. After installing CutPaste and NotePad with 25K for the user file, 530,992 bytes were still remaining. Adding DeskTop left 404,768 bytes of memory. It was still possible to install *1-2-3*, Release 1A, the PC Magazine Labs benchmarks, and *Textra* word processor, with no memory left over. Entering Remove six times restored my system to its original 597,520 bytes.

How well does *Resident* work with other RAM-resident programs? The answer is mixed. To test this I used one perfectly well-behaved notepad utility, called *NP*, and a somewhat troublesome utility, *SideKick*. Both *SideKick* and *NP* were successfully installed after *Resident* programs; however, once installed, the *Resident* programs could no longer be

> ■ How well does *Resident* work with other RAM-resident programs? The answer is mixed.

removed. Further, when the *Resident* application was terminated, the system crashed with *SideKick*, but did not with *NP*. Installing *SideKick* before loading the *Resident* applications also resulted in a system crash, but everything again went smoothly with *NP*. Once loaded on top of *NP*, such *Resident* applications could be removed normally. This is not as bad as it sounds since *SideKick* bends the RAM-resident rules considerably.

In short, *Resident* allows any application to be made resident and instantly switched in and out. The CutPaste and NotePad utilities included are worthy additions to the package. The DeskTop utility provided is less useful. *Resident*'s price tag may be slightly steep, but it does everything advertised and does it well. If it has what you are looking for, I recommend it.

▼

Software Carousel

Software Carousel from SoftLogic Solutions, makers of *Disk Optimizer* and *DoubleDOS*, permits you to shift instantly from one applications program to another, without the need to stop and start each. Although this sounds like the same function *Resident* performs, *Carousel* achieves its magic in a completely different way.

Carousel divides up existing memory into separate DOS "partitions," into which you install different applications. No matter how deep you might find yourself in your database program, for example, if you need to make a quick note, you press a hot key and you are instantly presented with the prompt of one of the other DOS partitions. Once you have brought up your editor and jotted down the note, pressing another hot key pops you immediately back to where you left off in the database program. This novel approach makes each application effectively memory resident.

Carousel itself uses up some 75K bytes of system memory. Unlike all of the other programs tested, *Carousel* is copy protected. The master disk allows up to three installations, including onto a hard disk. A correctly installed copy of *Carousel* can be uninstalled and reused.

Once booted up, *Carousel* presents you with a new prompt indicating the name and size of the current partition. Depressing the Alt-Spacebar combination brings up *Carousel* itself, allowing you to change the names and sizes of up to ten partitions. Each partition has a key associated with it, the default being the function keys. Thus, entering Alt-F1 brings up partition 1, Alt-F2 brings up partition 2, and so on.

Carousel does not load different versions of COMMAND.COM in the different partitions. Other than the original 75K bytes for *Carousel* itself, there is little

memory overhead. *Carousel* can supplement normal memory (SoftLogic calls it "low memory") with varying amounts of extended RAM, expanded RAM, and/or disk storage. Thus, a 640K system with 1.5 megabytes of Above Board-type LIM (Lotus/Intel/Microsoft) expanded memory can load up some 2 megabytes of applications software. Of course, each single partition must still fit completely into lower memory. Since this expanded memory is very fast, switching from one partition to another, although noticeably slower, is still reasonably rapid.

It is possible to supplement RAM with disk storage, but this should not give the reader any misconceptions. Using a floppy disk as expansion area is ridiculous. Not only do partition swapping times become excessive, but also the floppy will have to remain in its drive lest the system crash during partition swap. Allocating large blocks of hard disk storage works much better. On my 640K-byte system, I easily loaded up multiple 512K partitions. Switching times stayed around 5 seconds. *Carousel* works best with RAMdisks, with switching times remaining almost instantaneous. Since all expanded RAM cards include RAMdisk software, they allow *Carousel* to use non-LIM memory. I tested this with a 1.5-megabyte Magnum card. No matter what type of disk is used, *Carousel* is very good about cleaning up after itself, deleting its storage file when the system is rebooted.

This ability to supplement conventional

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TBMS

DATABASE POWER UNLEASHED

Text-based management systems combine word processing with database capabilities to help you maintain and manipulate textual data. One nice feature: TBMS fields can be of variable lengths with almost no maximum limits on size.

Vendors are always quick to compare databases to filing cabinets. While there are some superficial similarities—they both store and retrieve records based on an index—there are just as many differences. For one, with a filing cabinet system you can have an overflowing folder alongside an empty one. For another, you can have a miscellaneous folder. Within the same folder, you can have complete, incomplete, and different forms. And as far as you and your working habits are concerned, everything is where it should be. If you tried creating such a free-form system on a database, it would have conniptions.

So how do you store all the textual information that flows across your desk? Word processors can handle your documents, but their search capabilities are always limited to the document being processed. Even if they weren't, you would still be unable to manipulate the text as data. As for traditional databases, even in the best of circumstances they are a finger-in-the-dyke solution, wasting disk space and imposing re-

strictions when you can least afford them.

The ideal solution is a combination of word processor and database, such as the ten text-based management systems reviewed below. Text-based management systems (TBMS) are database programs with full-screen editors, variable-length fields and records, and (in some cases) fairly sophisticated retrieval features. They encourage ad hoc data entry, as well as ad hoc querying. Each of these systems offers a means of maintaining and manipulating textual data with enough power and flexibility to make using them more than cost-effective.

A STRUCTURED ENVIRONMENT With traditional DBMSs, you create a highly structured database. Every field within the record must be defined and typed beforehand, and every record must be identical in length and components. While there are any number of uses for structured databases, certain situations beg for more flexibility. Two of the most common are keeping track of two telephone numbers for the

same client and maintaining a searchable comment field. With a traditional database, you must define and allocate space for each individual item. If you have a large database and only an occasional comment or a few clients with two telephone numbers, the file quickly chews up available space even if the field is not being used.

A text-based management system, on the other hand, allows you to define a database with fields of variable length that grow dynamically. Some programs do not even require that the same components exist for each record. Others permit multiple-entry fields. As a result, if ten of your hundred clients have two phone numbers, only ten records are allocated space for the second number. If a particular record does not warrant a comment field, it does not get one. If a comment requires more space, the record accommodates it.

Occasionally, a TBMS is confused with a text-retrieval system such as *Zyindex*. While both work with textual information, they approach the task differently. Text-retrieval systems do not create databases so much as organize and catalog precreated documents. A TBMS, however, includes its own means of data entry and retrieves data either with an index or by performing a full-text search. Some systems also provide features to generate reports and do simple math operations.

There are two basic types of TBMS: totally free-form and controlled free-form, with the former primarily offering flexibility during data entry and the latter providing a familiar structure. Programs such as *Instant Recall* and *AskSAM* fall into the totally free-form category and can be thought of as having fields of variable length. With them, you can enter records in any manner you wish and declare fields, if you feel the need, afterward. *Notebook II* and *Sequitur* are representative of the controlled free-form variety of TBMSs, which permit only their fields to be of variable length. With these programs, you have to define the record's fields before you enter the data.

While some traditional database programs allow indexes and Boolean searches, text-based programs tend to excel at them. You can usually perform full-text searches with wildcards and keywords,

and such operators as "contains," "before," and "does not exist." Keywords are topics you enter into a specified field, which the program indexes and uses as a look-up table. In addition, a few of the programs allow you to define "stop" words, words that are not indexed and are searched for only when they are part of a specified string. Stop words are usually articles, prepositions, or conjunctions—that is, they are noise words that are meaningless by themselves and are important only in context. If the program has such a feature and you cannot modify it, you may find it difficult to search for such things as

the postal abbreviations, for example, of Oregon and Indiana—(OR and IN).

ASCII FILES IMPORTED All the programs reviewed here permit direct importation of ASCII files. But if you think the process is painless in each case, think again. Virtually all the programs require that you massage the file before it can be processed. In most cases, this simply means preceding the fields with their field names. But, in some cases, you also need to signal the end of the field with a distinctive character. So you may find yourself spending some time with your favorite word processor or high-level programming language before you can use a particular TBMS (thank God for Turbo Pascal). To complicate matters, some of these programs lack a clear description of the file format. Even when they do have a description, the actual transfer process is less than elegant and occasionally requires hours to complete. Granted, the problem may lie in the nature of the beast—that is, a record of variable length does not lend itself to simple importation—but by the same token, it should not be as onerous as it is in certain programs.

While some of the programs presently support simple mathematical operations, permit access to the extended graphics characters, and come with proprietary programming languages, future versions should provide even more support and features. For example, you can expect to be able to store simple graphics such as floor plans and schematics alongside your text, create sophisticated, user-friendly front-end systems, and access more than one database at a time. One feature I personally would like to see is a global search and replace with which you could append a multiple-entry field with data from another field. At the least, it would simplify the translation process of files from traditional databases.

Inmagic

Inmagic because its menu screens lack graphics and make no use of function keys, *Inmagic* looks like a CP/M carryover. That in itself is not a major obstacle—after all, *WordStar* and *dBASE II* have done well in the PC market-

Text-Based Management Systems: Summary of Features

Product	Executive Filer	Instant Recall	PC SqueezeNote	Seqeltar	Notebook II	PC AskSAM	Dayflo	Mist+	Iemagic	PC Memo Plus
LIST PRICE	$49.95	$69.00	$69.95	$79.95	$189.00	$200.00	$495.00	$495.00	$975.00	$1,495.00
FILE STRUCTURE										
Fields	Required	Required	Optional	Required	Required	Optional	Optional	Required	Required	45
Multiple entry	8,000 bytes	4,800 bytes	36,000 bytes	48,000 bytes	Required	1,600 bytes	32,000 bytes	12,000 bytes	Unlimited	Unlimited
Max. field size	8,000 bytes	4,800 bytes	36,000 bytes	48,000 bytes	50K bytes	Disk	32,000 bytes	Unlimited	Unlimited	Unlimited
Max. record size	512 Mbytes	2 Mbytes	Disk	8 Mbytes or disk	Disk	Disk	32 Mbytes	4 Mbytes	Disk	Unlimited
Max. file size										
EDITOR FEATURES										
Block operations	●	●	○	●	●	●	●	●	●	○
Search and replace	●	●	○	●	●	●	●	●	●	○
Underline	●	○	○	●	○	○	●	●	○	○
Bold	●	○	○	●	○	○	●	●	○	○
Merges	●	●	○	●	●	●	●	●	●	○
DATA IMPORT/EXPORT										
ASCII	●	●	●	●	●	●	●	●	●	●
Other	○	Cut and paste	○	●	○	○	●*	○	○	○
Max. import file size	Unlimited	2 Mbytes	Unlimited	48,000 bytes	Unlimited	Disk	Unlimited	Unlimited	Unlimited	Unlimited
DATA MANIPULATION										
Indexing	Optional	Automatic	Optional	Optional	Optional	●	Optional	Optional	Optional	Optional
B trees	●	○	○	b – tree	○	○	●	●	●	●
Inverted files	○	●	●	○	●	●	○	○	○	○
Keyword/lists	●	○	○	●	○	●	○	●	○	○
No. of keywords	10	N/A	100	N/A	2	N/A	100	12,000 chars.	1,679,615	
Max. no. of characters indexed	140	All	20	All	18	N/A	30	45	59	User-defined
Stop list	○	○	1	975	Unlimited	Unlimited	10	3	Static	User-defined
Max. no. of sort fields	○	○							5	20
SEARCHES										
String	●	●	●	●	●	●	●	●	●	●
Keyword lists	●	○	○	●	○	●	○	●	○	●
Boolean	●	●	●	●	●	●	○	●	●	●
Comparison	○	○	○	●	●	●	●	●	●	●
Date	○	○	○	○	○	●	●	●	○	●
Proximity	○	○	○	○	●	●	○	○	○	○
OUTPUT										
Stored report definitions	○	○	○	●	●	●	●	●	●	●
Headers	○	○	○	●	○	○	●	●	●	●
Footers	○	○	○	●	○	○	●	●	●	●
Break points	○	○	○	●	○	●	●	●	●	●
Stored query definitions	○	○	○	●	●	●	●	●	●	●
Multiple-table access	○	○	○	○	○	○	●	●	●	●
FUNCTIONS										
Arithmetic	○	○	○	●	●	●	●	●	●	●
Aggregate	○	○	○	●	○	●	●	●	●	●
COMMAND STRATEGY										
Command line	○	○	●	○	○	●	●	●	●	●
Static menu	●	●	●	●	●	○	●	●	○	●
Windowed	○	●	○	○	●	○	●	●	●	●
Point-and-shoot	●	●	●	●	●	○	●	●	●	●
First letter/function key	●	●	●	●	●	●	●	●	●	●
Mouse	○	○	○	○	●	○	●	○	○	○
SPECIAL FEATURES										
DOS 2.0 directory support	○	○	○	●	●	●	●	●	●	●
Macros	○	○	○	●	○	●	●	●	○	●
Customized color	○	○	○	●	○	○	●	○	○	●
Security access	○	○	○	●	○	●	●	●	○	●
Programming language	○	○	○	○	○	●	○	○	○	●
Copy protection	●	Keydisk†	○	○	●	○	●	●	○	○
On-line help	●	●	○	●	●	●	●	●	●	●

● = Yes   ○ = No   *Dayflo is capable of importing files from PFS:File, dBASE series, WordStar, and Wang word processors.   †A non-copy-protected version is available for $10 more.   N/A—Not applicable   ■—Indicates Editor's Choice

place—but when coupled with its tortoise-
like pace, you wonder why it wasn't re-
written to take advantage of the PC's
features.

As long as you have ANSI.SYS in your
hard disk's root directory, installing *Inma-
gic* should be hassle-free. But to be on the
safe side, first copy your AUTOEXEC
.BAT and CONFIG.SYS files because the
installation amends them. While there is
an installation module for floppy-disk-
based systems, I would not recommend it
because the database files *Inmagic* creates
consume over twice the amount of space as
the imported ASCII file.

Inmagic consists of five main modules:
Define, Maintain, Select, Sort, and Audit.
Whereas most programs have you define
the database and then the records, *Inmagic*
requires you to do the opposite. Creating a
database involves entering the Define en-
vironment, selecting the Data Structure
option, and then defining your record. For
each field, you must enter a name, a label
(an abbreviation of the name), a sort code,
an index code, and a subfield value. There
are six different sorting orders and three
types of indexing: terms (greater than, less
than, from . . . to, and so forth),
keywords, and a combination of the two.

Searching on indexed fields is extreme-
ly fast and easy. Unfortunately, the same
cannot be said for the full-text search. The
tests run on these programs indicated that
the algorithm is far from efficient. When
performing a Boolean search on an in-
dexed field and an unindexed field, the

program actually searched through all the
unindexed records, even though it had al-
ready isolated the matches for the indexed
field. *Inmagic* also lacks a relation for
searching for a phrase that is not located at
the start of the field. Instead, you are re-
quired to perform a series of searches that
will—you hope—narrow down the match-
es until the desired record is isolated.

Inmagic's import facility is tedious at
best. Like many of the other programs, it
requires you to first massage your ASCII
file so that the proper labels or field names
are present. Then you need to invoke the
import feature. Loading the test database
took over 2 hours, and even after that,
when it encountered exceptions it did not
permit me to correct them, thereby neces-
sitating another import and the loss of an-
other 3 hours.

The on-line help facility, although not
context sensitive, does allow you to hone
in on your needs by following the help
keyword with the command or specific
area you need help in. Along with a de-
scription of the terms, you get examples of
how to use them.

While *Inmagic* is powerful enough, I
hesitate to recommend it wholeheartedly
because of its inelegant interface and its
slowness on a non-286 machine. [*At press
time, a new version of* Inmagic *had been
released. Its features include password se-
curity, a new report generator, numeric
calculation ability, a full screen editor,
and expanded on-line tutorials.—Ed.*]

AskSAM

In the market for a program that is intu-
itive, extremely flexible, and reasonably
powerful? One that allows you to store rec-
ords, queries, macros, and command
files? Something that you can use for keep-
ing track of inventory and sales, as well as
text? *AskSAM*. Among other things, *Ask-
SAM* supports arithmetic operations, has
an impressive command language, and
generates respectable reports.

With *AskSAM*, you can have it both
ways: structure and free-form. For those of
you who need the security of field names,
AskSAM will allow you to precede infor-
mation with explicit labels. If you cannot
be bothered maintaining a file with a rigid
structure, *AskSAM* will do without the

field names and still give you lightning-
fast retrievals. The beauty of having a
completely free-form program is that you
can enter any type of data anywhere within
any record. This means you can create a
template for those records or fields that
need structure and leave other records un-
labeled. Creating a database in *AskSAM* in-
volves only one mandatory step: entering
the data. Nothing else is required—no
field names, no field typing, and no field
sizing. If you want more than one value
per field without predefining it, you have
it. If you want a field in one record but not
another, *AskSAM* accommodates you.
About the biggest constraint in the early
versions of *AskSAM* was its 20-line limit
for records. Version 3.0 addresses this
limitation by including a document mode
that enables you to link records together
sequentially.

Locating items is simply a matter of ei-
ther entering the word or phrase directly on
the query line or entering it along with the
optional field name. For example, you can
either enter Peter Norton *or* AUTHOR
[Peter Norton]. If you want only Norton's
first name, you could use the command
Before, as in {Before} Norton. *AskSAM*
also has a command, called Before, for lo-
cating text that immediately follows a
known word.

Searches can be as simple as you like or
as complicated as necessary with the use of
the program's command language and
Boolean and comparison operators. Since
as much of the database as possible is

```
Your choice?          RECORD QUERY
[<Esc> done  Last-screen  Update    (other) next-screen
Petzold

[TITLE(Organize Your Desk and Your PC] AUTHOR(Charles Petzold] SECONDAUTH(]
VOL_ISSUE(482] PAGE(284] SUBJECT(Organize your desk: calculator/appt.book/phone
directory/notepad w/4 programs ]

[TITLE(Double Duty Directory Display] AUTHOR(Charles Petzold] SECONDAUTH(]
VOL_ISSUE(482] PAGE(189] SUBJECT(DIR program alphabetizes your directory & spl
it into 2 columns.]

[TITLE(Assembler] AUTHOR(Charles Petzold] SECONDAUTH(] VOL_ISSUE(422] PAGE(132]
SUBJECT(Assembly language programming used in business.]

[TITLE(A Sight Better than TREE] AUTHOR(Charles Petzold] SECONDAUTH(] VOL_ISSUE(
PAGE(199] SUBJECT(VTREE: visual tree command program displays your directory wit
a graphic touch.]

[TITLE(Gulfstream Professional Computer 88] AUTHOR(Charles Petzold] SECONDAUTH(]
VOL_ISSUE(481] PAGE(118] SUBJECT(Gulfstream Professional Computer 88:a PC AT
alternative w/lots of expansion room ]
```

AskSAM is simple but powerful. Because it brings as much of the database file it can into memory, it is capable of retrieving information quickly without indexing. Its language is extremely flexible and relatively simple to learn.

brought into memory, the retrieval times are almost instantaneous.

Next to its speed, the most impressive aspect of AskSAM is its language. It's extremely structured; operations are always performed directly from left to right or top to bottom. As a result, you are never confused as to what the output will be. In addition to if-then-else conditionals, the language provides support for memory variables, batch and mail-merge operations, and comparisons for numeric and date fields. The arithmetic support includes basic arithmetic operators and the Min, Max, Avg, Sum, and Count commands. The operations may be simplistic when compared to those available with traditional relational databases, but they do provide you with enough power to program applications the other text-based databases cannot handle. AskSAM also has commands for creating break points such as totals and subtotals in your reports, justifying, positioning output, creating headers, and printing the page number.

Its other features include support for up to four user-defined macro definitions, the ability to create command files that can be stored and executed at a later time, and a user-defined translation table for sorting foreign text. The manual is well written and well organized, with explicit examples. About the only things AskSAM does not support are multiple-file access, pop-up windows, and indexing—and all of them have been or are under consideration.

AskSAM gets my vote for the easiest, most versatile text-based database on the market today. It may not be as powerful as a few of the others, but many people do not need more power than AskSAM offers. If you don't believe me, AskSAM.

Sequitur

Sequitur is a command-driven program that offers structured fields, true relational capabilities, the ability to recall old versions of records, and a unique "browse" view of the database. It offers respectable power and flexibility but at the expense of a steep learning curve. It is also a program with a bad case of "keyitis."

Before you can define a database in *Sequitur*, you need to understand how the program displays the database. As with other relational programs, *Sequitur*'s databases are composed of tables, columns, and rows. You create a table, which is analogous to a file, by defining its variable-length columns (fields). However, *Sequitur* displays the table uniquely. Es-

sentially, what appears on-screen is a grid of windows. Each cell displays as much of a column as you wish. If your cursor is within the cell, you can scroll the cell so that you can see the underlying text.

Because of this feature, you need to define a length and height for each column when you create the table. (Once again, these declarations do not affect the actual size of the field, only the amount of text being displayed in the tabular browse mode.) If you define each field's width as one or two characters in length, you will be able to display most if not all of your database's fields on an 80-column screen, even if you cannot make sense of what is actually contained within each cell. Of course, if you wish to view one record, you issue a Zoom command and the record is displayed in form view. Within the form view, you can use the full-screen editor to make any changes on the entire record.

In comparison, searching through the database is straightforward. You issue the Search command and enter the column to be searched and the text to be searched for, and the results are displayed on-screen. Nonindexed searches are unimpressive in terms of speed, and the times for an indexed query are within a few seconds.

While many programs allow you to undo the most recent edit, *Sequitur* goes one step further and maintains all edits until you compact the database. As a result, you can recall an old version of a record and make it the current version. This is possible because rather than modify the actual record, the program tacks the modifi-

```
DATABASE: article                           Showing table: art
DATABASE                                     Press (F1) for help
|Title               |Author    |Secondary|Vol-Pag-Subject
```

For the traditional database user, Sequitur offers many of the same features found in relational DBMSs, but its windowed browse mode is unique.

cation onto the end of the file and marks the original record as updated or deleted. As long as you do not pack the database, the record still exists and is accessible.

Sequitur has a number of other features, including the ability to define areas of text as an object and then manipulate it as an entity. You can also create a slice of the database for viewing and generating reports. Most of all, though, *Sequitur* has "keyitis." Virtually every key, from the function keys through the number keys on the top, is defined for commands. The program comes with not only a keyboard template but also a quick reference card and an on-line help facility that duplicates the same information—and you need them all.

Mastering *Sequitur* takes more time than with most of the other programs because of its various modes and commands. Even after you learn to navigate through the tables, you may still have problems because *Sequitur* commands are implemented differently from those in other programs you may be used to. Nevertheless, if you persevere, you will have a powerful tool.

Mist+

The claim to fame of *Mist+*, "the Networkers' Electronic Toolchest," from 2B Enterprises, is its support for telecon-

ferencing and networks. So much support, in fact, that you could almost set up a small man's fully interactive CompuServe. *Mist+* is a command-driven, multilevel program offering structured fields, three retrieval, and an editor with sophisticated formatting commands. In addition it allows you to create program files and join

customize the interface somewhat.

All is not perfect, though. Written originally in 1980 for CP/M machines, *Mist+* still shows its roots in its interface. And, to make matters worse, the much-needed documentation consists of a poorly organized loose-leaf-bound manual that has little regard for traditional terms.

When you call up the program, you're put in the *Mist+* command environment; the database is one level below. Creating a database in *Mist+* consists of entering the command Add-Database (abbreviations are accepted), answering a few prompts for the filename and general access level, and then entering the command Add-Format, wherein you declare the fields (called item parts or resources).

Each field in a record (also called a resource) can be one of seven types, among them character, numeric, keyword, and text of up to 12,000 characters. You also need to define a *picture* (a common programming term that describes what the input should look like), decide the access levels for the specific field, and state the maximum number of characters on which to index the field. You cannot index the text field.

Once declared, you can enter data into the database directly or by importing it. If you are importing, *Mist+* will add four

```
For use with the IBM Personal Computer and the Hayes Stack Smartmodem
      Running under the MS DOS 1.1 or 2.0 operating system
      Serial Number:       000010854 -- System 10

         Copyright (c) 1983, 1984 by Johnson-Lenz
         Portions copyright (c) 1983 by FairCom
```

```
CONTINUE resources
Entering RESOURCE by subsystem
RESOURCE: text
FIND BY WHICH PARTICLE
ARTICLE database open.
RESOURCE: text
FIND BY WHICH PART (Subject="Z&B"
6  ARTICLE resources in current list.
RESOURCE: then
FIND BY WHICH PART (Subject="then"
2  ARTICLE resources in current list.
RESOURCE: helps
FIND BY WHICH PART (Subject="helps"
73 ARTICLE resources in current list.
RESOURCE: CONTINUE online
```

Mist+ combines a text-oriented database with telecommunications. Its command-driven interface, which reflects its CP/M heritage, allows only one command at a time.

records and then insist on having you hit Return before continuing. (When I first started using a personal computer, I thought my pencil-pushing days were over and done with. Little did I suspect I would be using one to hold down the Return key so that the process would be automatic rather than tedious.)

Mist+ offers a full range of Boolean operators. In addition to searching within the database, you can search between files and use the results of one search as a pointer into another file. Indexed searches are quick, and you'll find that full-text searches are almost as fast. The program reports only the result of a search; if you wish to display the results, you must issue the Retrieve command.

The *Mist+* language is a full-blown interpreter with conditionals, data structures, and simple math facilities. It supports Xmodem protocols and allows you to generate queries from remote stations on a distributed network and transmit the search results with error checking. While the majority of the language is not necessary for database usage, it can come in handy for developing front-ends and stored routine files. Although the language is powerful and flexible, you'll probably have trouble learning it.

The program's documentation is so poorly organized that you will have to flip back and forth between the glossary, index, and chapters so often that the pages will fall out, and you will be calling tech support simply to locate something in the

R:BASE SYSTEM V: USING A TRADITIONAL RELATIONAL DBMS AS A TBMS

Microrim's new DBMS offers free-form capabilities plus structure.

If you require advanced mathematical functions, heavily structured and typed fields, and a long text field, you might consider using a traditional database management system (see "Project Database II," *PC Magazine*, Volume 5 Number 12 through 14). Many of them, such as Ashton-Tate's *dBASE III Plus*, provide long text fields. By the same token, the majority of these programs support their text fields in only a limited manner. That is, you usually cannot search or index the fields. As with all things, there are exceptions.

If you must have structure but would like to have some free-form capability, consider *R:base System V*. Basically a command-driven approach with an optional menu-driven shell, *Rbase System V* encourages the creation and manipulation of a fairly sophisticated relational da-

tabase without overt use of the programming language. Because many of its modules use prompt-by-example technology, you can learn and use the program immediately. It boasts a number of features, including a very slick import/export utility, a truly remarkable forms generator, and extremely good error-checking facilities.

The feature that mandated *R:base System V*'s inclusion in this article, though, is its note field. Unlike most other note fields in traditional DBMSs, *R:base System V*'s is searchable. The program also provides 13 functions dedicated to string manipulation. The note field can contain a maximum of 4,092 characters per record. While this limit may not be enough for everyone's needs, you can extend it. The easiest way of extending the field length is by dividing any long documents into two or more records and including a field in each record to show their relationship.

Although the inclusion of the note field does not turn *R:base System V* into a text-oriented database package, it does presage the following: TBMSs and DBMSs are beginning to encroach on each other's markets. As more TBMSs have mathematical or aggregate functions, such as those found in *AskSAM* and *Sequitur*, they will be able to perform more of the applications traditionally handled by DBMSs. Similarly, as more traditional DBMSs add larger searchable note fields, they will be used increasingly for textual applications.

—*Vincent Puglia*

manual. It took me over an hour of intense searching before I could find, for example, the sections to help me massage an ASCII file for importing—the appropriate sections are not listed under import, transfer, or ASCII but are listed instead under input

format and database reformat.

Once it's up and running, *Mist+* may be an excellent database, but don't expect that to happen easily, especially considering the program's checkered CP/M heritage and obtuse manual.

Instant Recall

With its optional memory-resident mode and its ability to cut and paste between an application and the reminder tickler, *Instant Recall* is the *Smart Notes* of text databases. A totally free-form system, *Instant Recall* encourages you to enter records as you wish. It doesn't permit report generation, math manipulation, and multiple-file operation.

Instant Recall's interface is simplicity itself: a command bar, a status bar, and a no-frills, full-screen editor between the two. You access any of the 16 commands with a Ctrl-key sequence and enter records much as you would write notes with Borland International's *SideKick*—helter skelter. Records can be up to 60 lines in length and block operations are carried out with the Cut, Ditto, and Paste commands. When you save a record, you can optionally set a reminder date that will tickle you when due.

When *Instant Recall* is in memory-resident mode, you can use the block commands to cut and paste to or from other applications and from within the database itself. A Window command allows you to split the screen so that both applications are visible or to snap the screens so that you can access the application beneath.

Instant Recall searches the entire text for words and phrases and provides you with two Boolean operators for specifying the criteria. You can also locate records by the date they were created or modified. A

successful query brings the first record satisfying the search criteria to the screen; all others are accessed by the gray Plus key. If the query retrieves more records than you would like to view, you can further narrow the search or jump to a specific record within the retrieved ones. While the search is immediate, the criteria are not highlighted and the cursor simply sits in the Home position. As a result, you may have to search visually for the section with the information you need.

As with *AskSAM*, importing ASCII files is a matter of naming the file to be imported, the number of maximum lines per record, and the record delimiter. Upon completion, you are left at a blank record. To see the last record imported, you need to hit the gray Minus key. Exporting records requires running a search first and then naming the output file. Each exported record includes a tilde (~) as the last character. Although you can output your records to a file or the printer, report generation is nonexistent.

Not only does it lack a report generator, *Instant Recall* has a bug in its retrieval algorithm. While searching for the nonexistent word *these*, the program located 17 records with the word *their*. Further investigation showed that the program also had trouble telling *there* and *these* apart.

On-line help is available in the form of pressured records. For the most part, they repeat rather than amend the documentation. The tutorial, which you can also consider to be free-form, shows various types of records.

Instant Recall may not be as powerful as some of the other programs reviewed here and it may not have an elegant interface and a report capability, but it does offer features not found in other programs.

SquareNote

Union Squareware's *SquareNote*, called "the Idea Librarian," may not knock your socks off, but it will do what you want it to—maintain a database and retrieve records as fast as possible. *SquareNote* permits the use of optional keywords (called subjects) and gives you the ability to browse through records, a feature many of the programs reviewed here lack. The program's biggest drawback is its appearance.

Not only does it have the look of a program designed primarily for home use (when you open an active file, the screen displays five index cards with three lines of text each), but it limits the number of records you can see at any given time.

Each *SquareNote* record, at a maximum length of 500 lines, consists of the following optional sections: keyword, header, and body. If you do not enter a keyword list, the program assigns the record as "unclassified." You can alter the keyword list, individually or globally, at any time. *SquareNote* indexes only the keywords and uses only one form of search—a full-text string search. While the search can be abominably slow, you can cut retrieval time down to almost nothing by using keywords. They facilitate search operations by allowing you to select a subset of records to search. While you can select only all or just one type of keyword at a time, you can expand the size of the set by adding records that match other keywords. The use of keywords also enables you to replicate the effect of most Boolean searches—which the program lacks—by selecting a set of records that match the first argument and then completing the search on those records.

SquareNote suffers from minor annoyances, such as slow I/O, a tendency to buzz too much, and an import facility that is too sensitive. The import requires that your ASCII file begin with the command $$<IMPORT>$$, followed by the appropriate optional parameters. It took me a

PROBLEM: The more experience your hard disk has, the harder it has to work.

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Disk Optimizer works by finding all the scattered pieces of your files and putting them

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Before you optimize, you'll probably want to analyze. So Disk Optimizer shows you, in percentages, how much fragmentation has taken place—on the entire disk, in individual directories, or for groups of files you specify using global or wildcard names.

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CIRCLE 334 ON READER SERVICE CARD

```
"ARTICLE" has 1434 notes.  ALL are selected.

Puglia:504:database:◄
File It with a Clean-out Winner: CleanCut◄
Vincent Puglia

Meyers:financial analysis:410:◄
Enter at Your Own Risk◄
Thomas Meyers

Waldman:graphics:308:◄
Computer Graphics from the Launching Pad◄
Barry Waldman

Alsop:standardization:509:◄
The Myth of Standardization◄
Stewart Alsop

Porter:dictionary:404:◄
Spoken On-Line◄
Irvin Porter

Main menu
Edit:    Make Query Select Subject Alpha Keyu Imprt Sort Label Unit
Use "^," "^." or "^;" "^=" from to move the note pointer. (CrlW) (CrlN) to search
            E = Examine [and edit] the text and/or subjects of this note
```

SquareNote's implementation of keywords allows you to locate items even if the text does not include the actual string or phrase being searched. It is also one of the few TBMSs that have a browse mode.

few attempts before I realized that the program was looking for all capital letters in the command.

Calling up help by hitting the F1 function key is a lot like chugalugging a beer: a quick buzz, a long wait, and then an easy letdown. It isn't that the context-sensitive help is bad, it's just that you expect more when you hear the buzzer and are disappointed when you are simply given the necessities. The manual also tends to be concise, but somewhat slim. For example, a Power User's Page provides such information as how to avoid seeing certain screens (hit Return) when you expect something like how to perform a Boolean search without a Boolean operator.

Despite its drawbacks, *SquareNote* is an efficient program capable of satisfying anyone who wants a free-form TBMS for maintaining notes. It may not have the fastest full-text search algorithm and it may not have Boolean operators, but it does allow you to separate and gather your records with a minimum of fuss.

Notebook II

Pro/Tem Software's *Notebook II* is an easy-to-use, menu-driven database that superficially resembles a traditional flat-file

manager, imposes structure on your data, and comes with its own report generator. Its *WordStar*-like editor includes block moves, patterning, an Undo command that cancels the effects of any edits in the current record, and the ability to enter extended IBM characters. You can also assign up to ten foreign characters to Alt-function-key combinations. Despite these features or perhaps because of them, *Notebook II* is also a program with few surprises and little flexibility.

You create a database in *Notebook II* much as you would with any database; that is, you name the file and fields and enter the data—no data typing and no hassles. In fact, you don't even have to index since the program does it automatically. If you want, you can sort the database on up to the first 20 characters of any one field and restructure the database at any time.

Notebook II provides two commands for searches: Find and Select. The Find command is a non-Boolean search on one field or the entire record that locates and displays one record at a time. Because the criteria are carried over, you can re-Find to locate the next matching record. Select performs Boolean searches and gathers more than one record for inclusion in a view. (Views are slices of the database that can be maintained separately.) For the most part, you search by selecting a specific field and supplying the text criteria to look for. Version 2.2 adds the ability to search throughout the entire record in one fell swoop.

Although Pro/Tem's program indexes the database, the testing results seem to indicate that the algorithm can do with some improvement. Timings of over 1 minute are not uncommon when performing a full-text search. Even when you specify an individual field to search in, the operation can take as long as 45 seconds.

While *Notebook II* is easy enough to use, it does present some restrictions in the guise of features. For example, the ability to create a view may seem advantageous until you realize ad hoc browsing of the database means creating and deleting views. Also, the imposed structure means each record must still have the same fields, even if they are not being used for that particular record. Finally, the prompted search commands prevent you from stringing together a long Boolean search. That is, rather than entering Select ROM *and* configure *and* boot-up you have to enter each criterion separately.

The documentation is well written and supplies such information as instructions for massaging an ASCII file for importing, techniques for restoring a damaged file, and examples of customized reports. At times though, I found some of the statements disturbing. The first one that caught

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by WORDTECH

my eye was, "It would be peculiar, to say the least, to merge a database of books into one containing names and addresses." Such a statement is more indicative of the program's deficiencies than anything else. I also wondered at the suggestion of setting buffers to 99 in the CONFIG.SYS file to speed up the program—do you then forgo using memory-hungry programs or reboot every time you leave *Notebook II*?

If you crave structure, shun flexibility, and care little about speed, *Notebook II* should satisfy your needs.

Dayflo

Dayflo is a fully free-form TBMS with some extremely impressive features that enable you to fudge relational operations. It provides a full-screen editor and a sophisticated, but optional, report generator program, called ReportFlo. It also makes liberal use of function keys, Ctrl-key sequences, and menu bars and comes with context-sensitive on-line help and Science Research's *SmartKey*, a well-designed macro-definition utility. Although still slow in some places, Version 1.3 is much faster than the earlier version.

Dayflo is also one of those programs that insist on getting in your way by using terminology that has different connotations in other programs (such as the term *stack* used to define a collection of records in a specific work area). And since the program is extremely powerful and flexible, that quirk, however small, is a shame.

Creating a database can be as simple as entering data into a form or as complicated as designing a form, setting the keyword indexes, and isolating sections of the file into different work areas. Because of *Dayflo's* free-form nature, records can have any number of field components you desire. In fact, back when we were testing the traditional database programs for "Project Database II" (see Volume 5, Numbers 12 through 14), I imported all three test files for relational databases into *Dayflo* and kept them separate by designing different forms and assigning them to different stacks. I was then able to pull related information as though the stacks were tables in a relational database.

Like *Notebook II*, *Dayflo* supplies two commands for locating text: Get and Re-

trieve. While both commands perform either full-text or keyword searches depending on the criteria supplied, the Retrieve command is more flexible and powerful. Unlike the Get command, Retrieve allows you to search on multiple fields and with various conditions and then allows you to store the records at the location of your choice. *Dayflo* also provides a search-and-replace command, which is used during the edit mode.

One of the biggest drawbacks in earlier versions of *Dayflo* was the import facility. Rather than allow you to declare what constitutes a record, the program pulled the entire file, or as much of it as meets the maximum record capacity, into one record. As a result, you then had to cut and paste the mass of information into separate records. (A 1,000-record file took at least 10 hours for the conversion.)

The new version includes a text-conversion module that eases and quickens the process immensely. You simply declare the fields, specify their types, and name the file to be converted. In my attempts at using the text-conversion program, only every other record was converted. I eventually discovered that although the documentation states that records should be separated by a single Return, the utility is actually looking for two. Once converted, the file can be brought into the *Dayflo* system by restoring it as though it were a backed-up file—a 20-minute process. You

then have the option to modify the dictionary and reindex the database. At this point, *Dayflo* slowed noticeably, and the operation took approximately an hour.

Dayflo is an extremely flexible and powerful program that suffers from a number of small obstacles (such as terminology, the size of its manual, and a slow indexing speed) that make it difficult to learn and use. To *Dayflo's* credit, though, the new version of the program has addressed some of those concerns, and presumably later versions will eradicate the others. I like the program. It's not perfect, but I like it.

Marcon Plus

Power and features galore—that's what Airs's *Marcon Plus* offers. You name it, this package probably has it—from saved queries and prestored data-field types, through a variety of indexes and lists, to multiple data entry fields and multiple database searches. *Marcon Plus's* intelligent use of function keys, pop-up windows, and point-and-shoot technology make it not only easy to use but also pleasurable. Its search and retrieval times, while not necessarily the fastest, are more than acceptable, especially when you consider the program's other features.

While *Marcon Plus* requires you to enter your data into fields, it eases the process by providing you with a set of predefined data types. The fields appear in a window on the left-hand side of the screen, and you select them by pointing and then hitting Return. (This selection process is followed throughout the program.) If you wish to modify or create fields, you do so by hitting a function key and calling up another menu.

Defining your own fields requires entering its name, an optional description, its data type (alphanumeric text, document text, date, date stamp, and number), its access code, and any validation criteria. You can also define the field as belonging to a specific list, as well as describe other criteria, such as whether it is to be indexed, to be used for a sort, and should have only one value or all caps or a maximum length. You can also nest fields within other fields—which is not the same as creating a multiple-entry field; a nested field is essentially a hierarchical construct.

The Diconix 150. So light it's the one PC printer you can take lightly. Anywhere.

```
┌─────────────────────────────────────────┐
│      Search Matches from MARCON II Manual │
├─────────────────────────────────────────┤
Match number 1 of 16
                      ┌──────────────────────────────┐
Chapter    Retrieval  │ Leave this window        (F3)│
Manual Text 4          │ Previous record          (F4)│
                       │ Next record              (F5)│        with MARCON. MARCON
          Find         │ Previous search data (Ctrl-PgUp)│     information
          uses rear    │ Next search data    (Ctrl-PgDn)│
          retrieval    │ Show all fields          (F5)│
                       │ Enlarge this field   (Alt F5)│
          This page    │ Print or Write           (F6)│        e for searching your
          records a    │ Go to reports        (Alt F6)│        ussion of how you
          conduct a    │ Delete record from answer set (F7)│   es which you can
          perform a    │ Change search data       (F8)│        database.
                       │ Edit Query Result    (Alt F8)│
          Befo         │ See search data          (F9)│        may want to review
                       │ Another search          (F10)│
Press ⬆ or ⬇ to move from item to item └──────────────────────────────┘
Press ↲ for menu of commands              Press ↹ to see search data
Press F for previous record               Press ⬆ ⬇ if finished searching
Press N for next record                   Press F10 for another search
```

Marcon Plus offers a number of features in its interface, such as pop-up windows, point-and-shoot, and function-key usage. Its database features are even more impressive.

Marcon Plus offers a number of features to facilitate data retrieval. The first is the quick look-up feature, which creates an inverted file index of individual words. The rest involve indexed lists. Searching with the quick look-up index requires selecting the field or fields on which to search and entering the search criteria. The program immediately reports the number of matches and highlights the text string. At that point, you can then make any changes with the full-screen editor or display the other matches. Because the quick look-up index covers the entire database, the search may take some time if your database is large.

If you need a faster search and know you do not need to look through the entire database, you can use a list search. *Marcon Plus* provides three types of indexed lists: add-on, unique, and preset. The add-on list consists of an index and an occurrence counter; that is, it tells you how many records contain the word in the list. A unique list is an index of a field that contains a unique value such as a document number. A preset list is an indexed list of predefined terms that can also be used to force certain types of data entry. If the word does not exist in the list, you cannot enter it into the field.

Searches can be simple one-word queries, or they can include one of the four Boolean operators. You can also search across ranges and within a specified proximity of a given word. The proximity search can be fairly exact. For example, you can search for "chips pre/5 ROM" for documents that contain both words within five words of each other.

Marcon Plus also provides an optional interface to word processing packages, as well as different access levels. When compared to the other programs reviewed in

this article, *Marcon Plus* is relatively expensive. If you need the program's features, it's money well spent.

Executive Filer

If you're looking for an inexpensive program that shuns computer terminology as though it were the plague, provides a completely free-form environment while allowing you to maintain your information in separate work areas, and offers fairly sophisticated word-processing features, you might consider *Executive Filer*. You might—at least until you realize it requires a key disk (a nonprotected version is available), does not perform string searches across records, and has a limited import facility. Some of *Executive Filer*'s split personality is the result of having been divorced from its other half—*Executive Writer*—when Adam Osborne bought the original program (then called *Idea Processor*) and began marketing it as two applications. The rest is simply the result of a limited program design.

In an attempt to make it more accessible to novices, *Executive Filer* uses such terms as *cabinets* (database), *drawers* (files or files, I'm not sure which), and *cards* (records). While these terms are appropriate for a paper-oriented filing system, they confuse the experienced user and hinder the novice. After all, virtually every other software package from DOS to *1-2-3* uses standard computer terminology.

If you ever manage to get past the manual, you might find this menu-driven program relatively easy to use, especially when creating a database. The lack of any

> ■ One negative aspect is the 8K-byte file size limit *Executive Filer* can import. This limitation hampers the program's utility as a serious business program.

imposed structure allows you to enter as much data—within the 8,000-character limit—as you like, anywhere you like.

Besides the usual block commands, the editor includes such features as underline, boldface, and justification. If you are a *WordStar* user, you can use Ctrl-key command codes; if you are not, a command bar is displayed on the screen's last line.

Just make sure you also enter a few keywords when prompted for them because *Executive Filer* uses them to fetch (retrieve) records. If your keywords are too broad and used by too many records, you may be searching forever. On the other hand, if they are on target, retrievals are almost instantaneous. Keywords are the only means you have to access the data. There is a string search command, but you can use it only in the editor.

Another negative aspect is the 8K-byte file size limit *Executive Filer* can import. This limitation hampers the program's utility as a serious business program. True, *Executive Writer* allows you to import a larger document into its system, but that alternative requires an additional step, not to mention cost. Finally, using the copy-protected version of *Executive Filer* on a hard disk is a chore at best. I'm willing to concede an install/uninstall scheme is not the end of the world, but there is absolutely no justification for the use of a key-disk scheme. ▨

Vincent Puglia is a frequent contributor to PC Magazine.

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he Hayes
Smartmodem 1200 is the unquestioned standard for
modems. Manufacturers that once offered their own
command sets now boast Hayes compatibility. And
even IBM Corp., a company known for setting, not
following, standards, has included the Hayes AT
command set in its recent modem offerings.

The strength of the Hayes standard lies in its predictability. With virtually all modems obeying the same commands, software developers can concentrate on developing better programs, rather than worrying about making them work with as many modems as possible. And, since virtually all communications programs work with the Smartmodem, even novice users can purchase a Hayes or Hayes-compatible modem without having to worry about software compatibility.

A standard doesn't change rapidly; it evolves. Once you improve it, you change it. And once you change it, it's no longer a standard.

The Hayes standard is showing signs of age, and several manufacturers, Hayes Microcomputer Products included, are attempting to bring it up to date. The six modems reviewed here (three from Hayes) all offer some advanced features. Although they have little in common, they are built on the current standard and all will work with software written for the original Smartmodem.

THE CURRENT STANDARD Although some modems claim Hayes compatibility while including little more than the AT dialing commands, most Hayes compatibles offer either the entire Hayes command set or at least as much of it as any program is likely to ever take advantage of. This means you get all the limitations along with all the features.

One of the annoyances in the Hayes command set is its insistence upon uppercase commands. Of course, if you send all your modem commands through a communications program, this won't affect you. A more significant limitation is that the modem can only dial blind: When it picks up the phone, it can't listen for a dial tone. Instead, it waits for a prescribed length of time, then dials. Similarly, once the call is dialed, it can't listen for a busy signal or other problem. It waits for a carrier for some preset length of time. Only then does the modem hang up.

Blind dialing is particularly frustrating if you are calling a busy bulletin board. Your choices are to manually restart dialing each time you hear the busy signal or to wait for your system to take time out between calls. If you opt for the second

> ■ The Hayes standard is showing signs of age, and several manufacturers, Hayes included, are attempting to bring it up to date.

choice, someone else may sneak a call in while you're listening to the busy signal.

Another limitation worth mentioning is the Hayes command set's lack of built-in help. Having to search for a quick-reference card when talking directly to the modem seems especially silly. Why not list the modem commands on the screen, preferably showing the current settings?

A survey of intelligent modems in the data processing market will turn up several other features missing from the Hayes standard, but most of these are irrelevant if you are using a PC rather than a terminal. A built-in phone book, for example, is usually better handled by your software, which can typically handle a much larger list of numbers.

THE ORIGINAL Strictly speaking, Hayes compatibility is concerned only with modem commands, modem responses (OK, ring, connect, and so forth), and the ability to specify a handful of settings to match what various programs want to see. However, the original (as opposed to the current) Smartmodem 1200 established a standard in a wider sense as well.

To meet the Hayes standard, a modem should be compatible with the Bell 103 protocol at 0 to 300 bits per second and the Bell 212 protocol at 1,200 bps; it should include a speaker so you can follow a call audibly as it is being made; and if it is an external modem, it should have a bank of status lights to show you what is happening and to aid in troubleshooting.

It should also offer auto-dial, auto-answer, manual dial, and manual answer in asynchronous mode. And, of course, it

should obey all or most of the 22 modem commands and 16 register settings of the original Smartmodem 1200, including the little-known S16 register for analog loopback test. (In analog loopback, the modem listens to itself. By typing at the keyboard and seeing the results on your screen, you can see whether your system is working and can determine whether a communications problem is in your system or elsewhere.)

This standard is not highly demanding. Most Hayes-compatible modems meet it. The possible exception is with the Bell 103 protocol, for which many modems limit themselves to 300 bps only. For most PC users this isn't a problem, since it's hard to find an on-line system that won't work at 1,200 bps, much less 300 bps.

Another common exception for external modems is in the status lights. Almost all of them include lights for Modem Ready (power on), Terminal Ready (computer is on and ready), Send Data and Receive Data (which flicker when data is sent or received), Off Hook (modem has picked up the phone), Carrier Detect (modem is talking to another modem), and High Speed (speed setting), but many of them lack a light for Auto Answer.

The Auto Answer light tells you whether the modem is set to pick up the phone. Without it, you could easily leave your modem set to answer when you didn't want it to. Your callers would then be greeted by the modem squealing at them. If you have an Auto Answer light, this oversight is far less likely to occur.

The original (not current) Hayes Smartmodem 1200B internal modem sets an even less demanding standard than the external version. Because it's inside the PC, it doesn't have status lights, and because it is (or was) a relatively old design, it takes up a full-size slot. Other than this, its features are essentially identical to the external version.

Many Hayes-compatible modems have gone beyond this wider standard in moderate ways. The Ven-Tel 1,200-bps internal modem, for example, is known for fitting in a short slot in an XT or portable PC. More recently, modems have been showing more-significant improvements. Among these modems are the new Hayes Smartmodems.

Hayes Smartmodem 2400

The Hayes Smartmodem 2400 is not simply a faster version of the Smartmodem 1200; it includes all the features of the 1200 and adds some of its own, including an expanded command set. Many of the extra features are simply added conveniences. For example, while the original Smartmodem had only one phone connector, the Smartmodem 2400 has two—one for plugging in the phone and one for plugging into the phone line.

Other conveniences may take some getting used to. If you're already familiar with changing DIP switches, you may be confused the first time you try changing the same settings by issuing commands to the modem. And if you're uncomfortable with typing commands directly to the modem, you may not be happy with the missing volume-control knob and the new software control of speaker volume.

These features open the door to interesting possibilities. For instance, a program designed for the Smartmodem 2400 could provide a simple main choice for controlling volume. Even better, with the modem settings under software control, programs can be written to automatically adjust the settings as needed. With no DIP switches, this would leave you with one less thing to worry about when installing your communications software. (Once changed, the new settings can be written to the modem's memory.)

What's more, if you use different com-

The Hayes Smartmodem 2400 has two phone connectors and the ability to change DIP-switch settings through keyboard commands. It also features an extensive set of test modes.

munications software for different applications, this feature can free you from having to check DIP switch settings when you change programs. Even if the software isn't written to control the Smartmodem 2400, you can automatically send the needed commands from a batch file when calling up the program, or from within the program by way of a macro.

ADDITIONAL FEATURES The Smartmodem 2400 also offers additional communications capability. The obvious new feature is the faster 2,400-bps operation. This uses the V.22bis protocol that is becoming the worldwide standard for 2,400 bits per second. Other new features offer additional functions rather than additional speed. Of these, call progress reporting and new dialing commands have the widest applicability. The Smartmodem 2400 can listen for a dial tone or busy signal, can report either of these to your screen or software, and can abort a call if appropriate. If your communications program includes a sophisticated enough script language, you can use these features to control branching in your scripts. You can also limit the

Smartmodem 2400 to blind dialing.

New dialing commands let you tell the modem to flash for half a second (for accessing PBX features), wait for a second dial tone (when calling through a PBX or long-distance carrier), or wait for silence.

The Smartmodem 2400 also has a much more extensive set of test modes than the Smartmodem 1200, including analog loopback, digital loopback, remote digital loopback, remote digital loopback with self-test, and local analog loopback with self-test. These are not features you'll use every day, but they can be helpful for troubleshooting.

Other new features include synchronous communications at 1,200 or 2,400 bps and compatibility with the V.22 protocol (which is standard for 1,200 bps in Europe and most of the rest of the world). The Bell 212 protocol is limited primarily to the United States and Canada. In theory, a V.22 modem in the United States can communicate with a V.22 modem in Europe, but in practice, difficulties often occur. The new V.22 compatibility eliminates those difficulties.

The additional commands in the Smart-

Modems: Summary of Features

Product Manufacturer	List price	Command sets supported	Internal or external	Uppercase response required	Protocols	Async modes	Status lights (external only)	Features beyond Hayes standard	Synchronous operation	On-off switch	DIP switch settings
ZOOM/ Modem PC (1,200 bps) ZOOM Telephonics Inc.	$220	Hayes, ZOOM enhancements	Internal	●	Bell 103, Bell 212	Auto-dial Auto-answer Manual dial Manual answer	N/A	touch-tone password protection	○	N/A	○
ProModem 1200 Prometheus Products Inc.	$495; optional 512K buffer, $149	Hayes, ProModem enhancements	External	●	Bell 103, Bell 212	Auto-dial Auto-answer Manual dial Manual answer	●	Two-level security and communications buffer	○	●	●
Omnibell Multifunction 1200-bps Modem OmniTel Inc.	$549 with Bitcomm; $599 with Relay	Hayes, Bitcomm, Relay	Internal	●	Bell 103, Bell 212	Auto-dial Auto-answer Manual dial Manual answer	N/A	Multifunction board	○	N/A	●
Hayes Smartmodem 1200B Hayes Microcomputer Products Inc.	$549	Hayes, Limited Extended Hayes	Internal	○*	Bell 103, Bell 212, V.22	Auto-dial Auto-answer	N/A	(Standard)	○	N/A	●
Hayes Smartmodem 1200 Hayes Microcomputer Products Inc.	$599	Hayes, Limited Extended Hayes	External	○*	Bell 103, Bell 212, V.22	Auto-dial Auto-answer	●	(Standard)	○	●	●
Hayes Smartmodem 2400 Hayes Microcomputer Products Inc.	$899	Hayes, Extended Hayes	External	●	Bell 103, Bell 212, V.22, V.22 bis	Auto-dial Auto-answer Manual dial	●	Settings held in memory	○	●	●

● = Yes ○ = No N/A = Not applicable *Modem software program translates lowercase response into uppercase. ○ = Indicates Editor's Choice

modem 2400 are outgrowths of the additional features. A few of these are extensions of commands in the old AT command set—such as the command that limits the Smartmodem 2400 to acting like a Smartmodem 1200 when dialing a phone.

Most of the new commands are "ampersand commands," meaning they start with AT& rather than just AT. These fall into categories: some handle functions usually found on DIP switches, some are related to synchronous communications, and some are related to the modem's onboard memory for storing settings. A final category is a catchall for new features, such as the new test modes. The modem also responds either to the AT command in uppercase or lowercase, but not mixed cases.

With the Smartmodem 2400, Hayes has made a real attempt to update a standard. When one of *PC Magazine*'s contributing editors was recently handed a pair of Smartmodem 2400s for testing communications software, he asked why we were using a modem that nobody has. When he handed the modems back, he said he was going to buy one.

Hayes Smartmodem 1200 and Hayes Smartmodem 1200B

After introducing the Smartmodem 2400, Hayes went back and revamped the Smartmodem 1200 external and 1200B internal modems. These modems muddy the Hayes standard by offering more commands and features than the old Hayes 1,200-bit-per-second modems did, but less than the Smartmodem 2400 does. If the old Smartmodem 1200 uses a standard AT command set and the Smartmodem 2400 uses an extended command set, the new Smartmodem 1200 is best thought of as using a limited extended command set.

New convenience features on the Smartmodem 1200 are limited to a second modular phone jack, software control of the speaker volume, and the ability to interpret commands in uppercase or lowercase. If you remove the front cover, you'll still find a bank of DIP switches for setting the defaults that the modem wakes up with.

The new Smartmodem 1200 adds the same call progress reporting and new dialing commands as in the Smartmodem 2400. And as with the Smartmodem 2400, you can turn this feature off and rely on blind dialing. Test modes are limited to analog loopback and remote digital loopback. Unfortunately, these use different commands than the test modes in the Smartmodem 2400.

The only other important new feature is compatibility with the V.22 protocol at 1,200 bps (for asynchronous communications only). A new DIP switch (not found on the old Smartmodem 1200) chooses between the V.22 and the Bell 212 protocols as the default. The modem can also be set for one protocol or the other with an AT command. The additional commands in the new Smartmodem 1200 are the mostly

The new Hayes Smartmodem 1200 is still the standard in modems for the PC market. It includes a speaker, a bank of status lights, and a second modular phone plug.

The Hayes Smartmodem 1200B is now short enough to fit into an XT short slot. The changes implemented in the Smartmodem 1200 have also been implemented in the 1200B.

same as the AT commands in the Smartmodem 2400. There are no AT& commands and no on-board memory to store modem settings.

These changes have been implemented in the new Smartmodem 1200B as well. One additional change to this internal modem is that it is now short enough to fit in an XT short slot. None of these changes is likely to drive you to scrapping your old Smartmodem 1200 so you can buy a new one, but all of these changes represent an important evolution of the PC modem standard. The call progress reporting, in particular, could lead to some useful additional features in the next revisions of popular communications programs.

ProModem 1200

Of the six modems reviewed here, Prometheus Products' ProModem 1200 offers the largest number of new features. At heart, this is a straightforward, Hayes-compatible, external modem with an optional communications buffer. It offers

The ProModem 1200's bank of status lights displays nothing until it is activated. Then it shows the indicator initials in red, a classy feature.

Bell 103 compatibility at 300 bits per second only, Bell 212 compatibility at 1,200 bps, and the usual auto-dial, auto-answer, manual dial, and manual answer capability in asynchronous mode only.

The ProModem's DIP switches are so

easy to get at and set, you'll find installation is almost trivial. You can reach them through a cutout in the bottom of the modem. What's more, a chart explaining the settings appears next to the cutout.

Another bonus is that the modem has two DB-25 connectors on the back. One of these is a female plug for the cable to the computer. The other is a male plug and is meant for a serial printer. If you have the optional communications buffer installed, the modem acts as a printer buffer also. According to a Prometheus Products spokesperson, this port can be reconfigured for a parallel printer as well. The change is so recent that it isn't even mentioned in the ProModem manual, but since most PC owners have parallel printers, it makes this feature far more valuable.

The ProModem's status lights are hidden behind a red plastic front panel with nothing on it except the modem's logo. They cover all the same functions as the

IN SEARCH OF A NEW STANDARD

Trying to predict which features will wind up in a new standard is a hazardous game at best, but what follows is a list of the features I'd like to see. The modem I'd rush out to buy would implement all of these features from the various modems reviewed here.

From the Smartmodem 2400, I'd take the V.22 protocol at 1,200 bits per second as an important step toward a worldwide standard. (Synchronous capabilities are also becoming increasingly important, but a goodly percentage of PC users can probably do without this feature.)

I'd stay with the two modular phone connectors (nearly standard by now), the response to AT commands in upper- or lowercase, and software control of the modem settings, with the accompanying built-in memory and lack of DIP switches. Call progress reporting is also a step in the right direction, as are the additional dialing commands.

From the ProModem 1200, I'd take the alphanumeric display, built-in security features, and built-in help screen. An optional communications and printer buffer (with the parallel port, please!) will probably have to wait for more people to appreciate it.

I may be paranoid, but given the choice, I'd take the security feature from the ZOOM/Modem PC as well—not as an alternative to the ProModem's but in addition to it.

And for internal modems, I suspect that the Omnipak Multifunction 1,200-bps Modem's multifunction approach will become increasingly popular as the full-length alternative for those who don't own a short-slot computer.

And most important, I'd ask for the modem industry to agree on commands beforehand—and maybe even tell software houses about it—rather than have each manufacturer come out with its own version of an extended command set.—M. David Stone

MOSART MODEMS: MATCHBOX SIZE AT 1,200 BPS

The Mosart chip might seem like a mighty small place to house a modem, but there's enough room for lots of features. One significant drawback: it's not Hayes compatible.

The Mosart Modem XE1201 and its voice-synthesizing brother, the XE1203 Mosart, are two modems from Xecom that have a little more than the others. Both of these 1,200 bit-per-second devices have all the sophisticated features you might expect, including Bell 212A and Bell 103 compatibility, dial-tone or pulse dialing, 300- or 1,200-bps transmission, call progress monitoring, parity generation/checking, built-in telephone-line and modem diagnostics, and synchronous and asynchronous modes. But what's unique about these little guys is that they are the product of CMOS technology and are housed in a chip that measures 2¼ inches long by 1 inch wide by ½ inch deep and weighs 1½ ounces.

In addition, the XE1203 Mosart processes voice communications through a headset that Xecom includes with the modems. The XE1203 Mosart automatically recognizes whether there is a human voice or a modem signal at the other end of the telephone line and switches to voice or data mode accordingly. This is one feature even the Hayes modems don't have.

NOT HAYES COMPATIBLE Xecom is presently fishing for other manufacturers to find profitable ways to integrate the Mosart chips into PC-based products. So

far, most of its sales have gone to industrial markets, though, because the Mosart chip has one significant drawback: it's not Hayes compatible and therefore won't run much of the communications software available to PC users. Vendors would have to include their own communications software with the Mosart for the modem to be practical.

Since the Mosart modems weren't planned as end-user products, the evaluation kit that Xecom is shipping consists of a Mosart chip mounted on an 8-bit board, which slips right into an empty PC expansion slot. An RJ11 telephone jack is attached to the rear-end, and the

XE1203 Mosart comes with a jack to plug in the microphone/earphone headset.

Everyone can use the Mosart modems in their present incarnation. People new to communications will appreciate the communications software and command set documentation included with the Mosart. Technical information is included for experts who want to sink up to their elbows in board-level programming.

GET RICH QUICK In money-making terms, the Mosart chip is still an open field, so people who come up with a new use for it might make a million bucks, Silicon Valley–style. For instance, a clone maker could make its product a notch better by making room for the Mosart chip on its system's motherboard. The company would install the Mosart and connect it to an RJ11 jack out the back of the unit. Voilà, it has a compatible computer with a built-in link to the outside world.

With a little programming, technical hobbyists could build a hybrid telephone answering machine and remote bulletin board system. Since the XE1203 Mosart can recognize both voice and modem signals, you could program it to answer calls and record messages. If you keyed in a certain series of numbers on a touch-tone phone, the XE1203 Mosart would send out a carrier signal for modem communications.

No matter what the XE1201 and XE1203 Mosart Modems are used for, one thing is for sure: these two 1,200-bps modems are living proof that small and powerful is the shape of things to come in the PC world.

—*Christopher Johnston*

Christopher Johnston is a free-lance writer based in New York.

lights on the Smartmodem but their appearance is different. When a status light is off, nothing shows. When it turns on, it shows the indicator initials in red: MR for modem ready, AA for Auto Answer, and so forth. The effect is far more classy and far less technical-looking than that of the Smartmodem.

If you have the optional alphanumeric

display installed, the ProModem also displays a digital clock through the front panel. When the modem is off, the clock doesn't show, but it doesn't need to be reset when you turn the modem on.

For basic communications, this modem behaves pretty much like the old Smartmodem 1200, except that it offers call progress reporting as well as blind dialing. And

if you have the alphanumeric display, when you type a command to the modem the clock disappears momentarily and the modem displays the command. Similarly, when it sends messages to your screen, it also displays the messages on the modem's front panel.

Though this feature may appear gimmicky, it's useful. It's particularly valu-

able if you are using software that intercepts the modem's responses and tries to hide them from you.

OPTIONAL BUFFER The optional communications buffer is an attempt to extend the communications features of the modem. It lets you store outgoing messages for the modem to send, and it will store incoming messages when the computer is off or working on something else. Basically, this buffer creates a private electronic system within the modem itself. The minimum buffer size is 2K bytes, but it's expandable to up to 512K bytes. (For an in-depth look at the communications buffer option, see "Buffers That Boost Communications Potential" in *PC Magazine*, Volume 4 Number 23.)

The ProModem uses its own enhanced

To take advantage of all the ZOOM/Modem PC's extra features, you'll have to write your own scripts. It also needs three different jumpers to choose the COM port.

version of the standard AT command set. This includes all the standard commands, plus a set of "AT&" commands that control the clock, communications buffer, and other extra features. The modem also has a help command that lists the modem commands on-screen, but, unfortunately, it doesn't display the current settings.

Two other features worth mentioning

are the security modes. One problem with leaving a system set for remote operation is the possibility of getting unwanted callers who might do anything—including reformatting your hard disk. The ProModem's answer is to create a password system. In the first security mode, callers have to enter a password before the modem will give them access to your system. In the second mode, callers not only have to enter the proper password but the modem hangs up on them and calls them back at a prearranged phone number. This second security mode will keep out even unwanted callers who accidentally hit on a password. If you need to leave your system available for remote callers, this security feature alone makes the ProModem 1200 worth your consideration.

ZOOM/Modem PC

The ZOOM/Modem PC, from ZOOM Telephonics, has taken a kitchen-sink approach to extending the Hayes standard. Rather than concentrating on a few features and doing them well, like Prometheus Products did with the ProModem 1200, ZOOM Telephonics adds a little bit of a lot of different things.

Features include Bell 103 compatibility at 0 to 300 bits per second, Bell 212 compatibility at 1,200 bps, and the usual auto-dial, auto-answer, manual dial, and manual answer in asynchronous mode only. And although the modem has its own extended command set, it includes virtually all of the standard AT commands. It even

includes the commands for transmitting Morse code, a feature that Hayes dropped from its new Smartmodems. It also requires uppercase for all commands.

The additional features on the ZOOM/Modem PC include new dialing commands, call progress detection, attack dialing, computer tone detection, and audio input "for connection to a voice synthesizer or other sound source." Optional features include a clock/calendar with battery backup, a touch-tone decoder for auto-answer password protection, and an 8K-byte memory buffer for storing incoming messages.

Call-progress detection is an undeniable plus. The extended result codes match everything on the new Smartmodems—the No Dial Tone, Busy, and No Answer codes—and they add seven additional codes for ZOOM/Modem PC features.

The password-protection touch-tone decoder is also a clear advantage. Like the ProModem 1200 security system, this is meant to keep out unwanted callers. The modem can be set to pick up the phone in auto-answer, but not send a carrier tone until the caller sends a password of up to three digits. This not only helps keep out people who don't know the password, it even hides the fact that you have a computer on the line. Dialing programs that systematically call phone numbers looking for computers won't reach your system.

The three-digit passwords are based on 16 touch-tones: the 12 standard tones on

your phone, plus 4 additional tones that the ZOOM/Modem PC sends with A, B, C, and D. This gives 16 times 16 times 16 possibilities, or 4,096 different possible passwords, if all your callers can generate the extra four characters. More likely, you'll stay with the 12 standard tones, giving 12 times 12 times 12, or 1,728 different possibilities.

The ZOOM/Modem PC sports other features, but their utility is questionable. Attack dialing, for instance, is just as easily handled by software; you probably already have a clock/calendar on your multifunction board; and there's nothing to be gained from being able to distinguish between a dial tone and a 400-MHz computer tone for long-distance dialing.

The memory buffer for storing incoming messages is certainly an interesting idea but with only 8K bytes of RAM and no room for expansion, it's more of a demonstration technique than a useful communication.

UNUSUAL AUDIO INPUT The audio input feature comes from left field. According to the manual, you can use it along with an audio synthesizer and the optional touch-tone decoder so that people can call in, enter commands from a touch-tone phone, and retrieve spoken information. Some situations might take advantage of this feature—say a touch-tone-activated message system with a computer dedicated to the task (I'd rather get a single package that includes the voice synthesizer and far better directions).

Overall design and quality of the ZOOM/Modem PC is questionable. This is the only modem I've seen that needs three different jumpers just to choose the proper COM port. And this is the first board I've seen where the volume-control knob came loose in my hand. I'm also troubled by the jumper block J5, which doesn't seem to be covered in the manual.

Ultimately, to truly take advantage of all the ZOOM/Modem PC's extra features, you'll have to write your own communications program or at least write your own scripts. If you enjoy doing that sort of thing, you'll have a lot of fun with the ZOOM modem. Otherwise, you probably won't be able to take advantage of all its extra features.

Omnipak Multifunction 1,200-bps Modem

Today's technology can put a fully functional modem on a board that fits in an XT's short slot, and many modem manufacturers are doing just that. With the Omnipak Multifunction 1,200-bps Modem, OmniTel has chosen a different route. It crams as much as it can onto one full-size board.

This modem has so many features that you may prefer to think of it as a multifunction board that happens to include a modem. Features include 384K bytes of RAM, a clock/calendar, a parallel port, a serial port, a joystick port, the usual software for a RAMdisk and a print spooler, plus it automatically feeds the time and date to DOS. The package also includes *BitCom*, a communications program that is easy to use but still sophisticated enough to handle most communications needs. And—how could I forget?—the modem.

Installing the Omnipak is more complicated than most modem board installations because you are dealing with a multifunction card and have to worry about COM ports, LPT ports, and memory addresses. The instructions are clear and the process is reasonably simple.

As shipped, the parallel port is set to LPT2, the modem to COM2, the serial port to COM1, and the memory configured for 256K bytes of RAM. The parallel

■ HAYES STANDARD

The Omnipak Multifunction 1,200-bps Modem crams as much as it can onto one full-size board, including 384K bytes of RAM, a clock/calendar, a parallel port, and a serial port.

port can be reset for LPT1, the serial port for COM2, and the modem for COM1 through COM4. The memory can be set for 0K, 256K, or 384K bytes. The manual wisely includes separate sections for setting the memory for a 64K-byte system board, a 256K-byte system board, and an AT. (The card can provide up to 128K bytes for an AT, bringing it to a maximum of 640K.)

The modem itself is a standard Hayes compatible, offering Bell 103 compatibility at 0 to 300 bits per second, Bell 212 compatibility at 1,200 bps, and auto-dial, auto-answer, manual dial, and manual answer in asynchronous mode only. It includes most, but not all, of the standard Hayes command set, and several of the commands from the limited extended Hayes set—including a modified version of the L command for speaker volume. Like the original Smartmodem, however, it responds only in an uppercase AT command.

One bothersome inconsistency in the Omnipak is that the results for the Busy and No Dial Tone results are reversed from the Hayes command set. This will not be a problem for software programs that ask to see the full word codes,

but it may lead to confusion for those asking only for the digit codes. Conditional statements that branch one way for Busy and another for No Dial Tone will work exactly opposite to the way they're supposed to.

I also ran into a potentially serious problem with the Omnipak. Although the modem worked fine when pulse dialing, I couldn't get a call completed when using tone dialing. A test of each tone showed that the phone network recognized only two of the tones generated by the modem, completely ignoring most numbers. An OmniTel spokesperson assured me that the modem normally works without problems, but a second unit showed the same symptoms. As of this writing, OmniTel has not tracked down the problem.

Except for the dialing problem, which may be caused by something as simple as a lot of bad chips, the Omnipak Multifunction 1,200-bps Modem works as expected. If I were putting together a system and needed both a modem and a multifunction card, the Omnipak would be a reasonable choice.

M. David Stone is a frequent contributor to PC Magazine.

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Business GRAPHICS *UPDATE*

*T*oday's business graphics software isn't simple. Before you select a product, you have to know whether you want things like graphing, slide output, animation, or clip art. While the programs have been getting better, they have also become more specialized. While you may be able to use just one graphics program for all your needs, it may not do everything as well as you would like.

These three programs, while markedly different, show the progress in graphics software. While both *Decision Images* and *VCN Concorde* will create animated slide shows, they have different strengths. *GraphStation* combines simplicity with data analysis power.

D **ecision Images**

Targa Systems Corp.'s *Decision Images* combines the text, data, artistic images, motion, and timing to produce impressive slides, slide shows, and video presentations. And although it has some significant failings, its ability to add movement and excellent color to charts, text, and data on the screen is a perfect example of the direction that business graphics software will be taking over the next few years.

One of *Decision Images*'s chief pluses is ease of use. For instance, you can enter data two ways, both of which you will find extremely simple. Suppose you wanted to create a cluster bar graph comparing the industrial outputs of Europe and the United States from 1981 through 1983. One way to do so is to answer a questionnaire that appears on a windowed screen. First, it requests your *x*-axis period labels—here, 1981, 1982, and 1983—then your *y*-axis bar labels, United States and Europe. Then it asks you to enter data for each axis.

As you enter this data, the program draws a cluster bar graph in another window. You watch as the

As business users increase their graphics sophistication, business graphics programs go right along with them. This latest crop adds animation, slide show, and video capabilities to the usual bag of tricks.

graph is built piece by piece, almost as if you were drawing it yourself. Most other programs hide the graphics from you until all data has been entered. This method gives you much greater control because necessary changes immediately become apparent during the construction of the graph itself. When the bar chart is designed to your satisfaction, you simply press F8, and the completed graph is produced on the full screen.

This process has limitations, however. For one thing, *Decision Images* allows for only 12 data columns, 6 bar labels, and 4 period levels. If you want only a portion of the data incorporated into the graph, there is no easy way to do so with the question-main method. But there is if you use *Decision Images's* second method for data entry, a spreadsheet. This spreadsheet doesn't rank among the best, but it is able to perform most basic arithmetic functions.

After entering the data into the spreadsheet, you select those cells to be included in the chart and tell the program the type of chart you want to build. Finally, again press F8, and the graph is drawn on the screen.

ADDING ICONS The graph at this point is complete, but the frame in which it resides is not. Now—and this is where *Decision Images* really shines—you can add text and decorative or informational symbols to the frame. For instance, if you want to add a map of the United States in the upper left-hand corner and one of Europe in the lower-left-hand corner, you just dip into the program's symbols library, which contains such icons as arrows, boxes, money, people, and states, and pull out the two maps you need. Instantly, they appear on the same frame as the bar chart. You would then position the maps in the proper locations.

Next, you would type, "The U.S. Struggles To Keep Up With Western Europe" at the bottom of the screen and, using the scrolling function, move it from the bottom of the screen to just below the graph.

Now, you'd save all this work and ask to see the screen using the F7 key, known as Refresh. Not only does the program show you the full frame, it presents this frame with a touch of showmanship: first the clustered bar graph is drawn on the screen, then the two maps slowly slide into posi-

tion, and finally the text scrolls into place.

What's more, each component of the frame can be edited at any time and be made to zoom, dissolve, and be constructed out of specs, as well as be redesigned with different fonts, colors, and sizing.

Decision Images clearly gets creative juices flowing the way a good business graphics program should, and it places information in an attractive environment.

The program does, however, have some inexplicable drawbacks that at times make it a chore to work with. When using the questionnaire input method, you cannot alter the kind of chart to be built—be it pie, line, or bar—without retyping all the data into the computer. And unlike nearly any other business graphics program on the market, *Decision Images* will not import data from spreadsheets like *1-2-3* or *Multiplan*. All data must be entered by hand.

CUMBERSOME COMMANDS While usually a graceful program to work with, *Decision Images* has some cumbersome moments. For instance, every time you add or edit a component in a frame, you have to request a display method for it: dissolve, zoom, specs, and so forth. That's reasonable enough. What's unreasonable is that *Decision Images* asks you to confirm this choice twice—as it does for many other program choices as well.

Another cumbersome requirement is

A sample pie chart created by Targa Systems Corp's Decision Images. *The data for this chart could not be imported from a spreadsheet like* 1-2-3. *It must all be retyped.*

that when making several similar edit requests for a variety of data and text, you have to go back to the command menu for each repeated request. Unfortunately, the software looks at each component of a frame as a separate element; it doesn't allow these components to be selected in tandem. For instance, suppose you want columns B, C, and D in the spreadsheet to accept numbers in the decimal format (the default is regular integer). To change the default, you have to go to the layout command, highlight decimal, then tell it which column is to be in decimal format—column B—and finally hit return. Now if you want to change columns C and D, you have to do the same thing twice more. Of course, it would be much easier to highlight columns B, C, and D the first time you ask to change from integer to decimal, but *Decision Images* will not accept multiple selections. Changing fonts and sizes of more than one line of text requires the same battle with the command structure.

But just as you grow tired of the agonizingly poor parts of the program, you happen upon another exceptional feature: assembly of the separate frames into a slide show. It's an easy process; you simply tell the program the order in which your frames should appear on the screen.

Each frame can be printed separately or turned into projection slides using popular slide makers like the Polaroid Palette. Moreover, the slide show can be turned into a video presentation with the Truevision Video Display Adapter from AT&T.

Decision Images deserves plaudits for its impressive creative side. Its color, even using the basic midresolution IBM Color/Graphics Adapter, is clear and sharply focused. But its developers should be made to answer for their serious lapses in the design of the user interface.

V CN Concorde

VCN Concorde, from Visual Communications Network, is an ambitious business graphics program that prepares charts, graphs, and text slides and enables you to paint and create on-screen shapes, forms, and symbols. The results can be output to most of the major printers and plotters or to slidemakers like the Polaroid Palette. You can input data with a keyboard, mouse,

Load, Save, or New Image Slide. Edit Patterns/Palette.

Graph Text Paint System Quit

This page of icons is taken from the menu of VCN Concorde. One of the program's advantages is easy selection of chart elements, such as fonts, sizings, and colors.

—or—and this is unique—video camera.

In some significant ways *VCN Concorde* is an excellent program. Creating a graph, for instance, is as simple as inputting rows and columns of data into a spreadsheet—or importing this data from .DIF file spreadsheets (*VisiCalc* for one), *1-2-3*, *Multiplan*, or *Symphony*—and then creating a layout template.

To design the layout template, you type in the kind of chart (bar, pie, line, and so forth) to be built, and then enter the chart's legends, data ranges, label ranges, and titles by highlighting the areas in the corresponding spreadsheet that contain this information. Next, enter the Plot command, which outputs the graphics to the screen. If you created a line chart, it can be changed to a pie chart simply by returning to the layout template and changing the parameter in the chart-type field from "line" to "pie." Text slides are created just as easily using basic input and editing functions.

EASY SELECTION You can restyle and edit any of the elements in the charts and text slides for a wide variety of fonts, sizings, colors, and spacing using the mostly uncomplicated command struc-

ture. *VCN Concorde* has one extremely functional capability: When you want to select an element to convert or redesign,

you move the cursor up to any portion of that element and, after you hit Enter, a box is placed around it. This way you are sure to have a clear marker denoting the selected area. In many other business graphics programs, the selected components are not highlighted in any way and there is always some question as to whether you have correctly marked the components chosen.

In all, *VCN Concorde* implements all of the basic business graphics functions well without taxing your patience. But when it attempts to go beyond the basic capabilities, it falls short.

For instance, adding animation to a slide is a frustrating experience. Suppose you want to position a rotating globe next to a bar chart that shows the world's industrial output over the past 5 years. To do this, you first create the bar chart—that's the easy part—and then you dip into a 2,000-symbol library and pull out the slide called globe. What you get is a screen full

of globes, each in a separate square cell. To select one globe, you have to position the cursor, as the documentation puts it, "one pixel within a cell border" and then hit Enter. The documentation continues: "The coordinates (listed in an animation

■ In all, *VCN Concorde*
implements all of the
basic business graphics
functions well without
taxing your patience.

form) should read 1,1,78,48." Unfortunately, the terms "coordinates" and "pixels" are undefined and incomprehensible

to most users of *VCN Concorde*. Indeed, it took me four tries before I got the coordinates to read 1,1,78,48 in the animation form. Imagine if I didn't have the documentation to guide me to these numbers (the coordinates change with each animation). I could be lost in the sizing process of one piece of animation for perhaps an hour.

BLIND SPECING Similar confusion reigns when you attempt to create a slide show. Unlike other business graphics programs, which typically offer this application by simply asking for a list of all files to be in the show and the order in which they're to appear, *VCN Concorde* requires that the files be preset into an umbrella "show file." After you call up the show file, a sort of storyboard comes on the screen, listing but not displaying each slide and every component on the slides—lines of text, graphics elements, and charts—

one by one. With no visual point of reference, you are expected to spec the slides, indicating how their individual components should appear during the show. (That is, whether they're to melt onto the screen or roll from left to right, or whether certain text is to scroll and other text is to explode into shape.)

The better solution, used by other software of this ilk, is to stylize the components of the slide show as you design the slides.

As you become aware of these disturbing weaknesses in *VCN Concorde*, the program's smaller flaws become increasingly difficult to dismiss. Among them:

■ The makers of *VCN Concorde* should have left the paint function out of the software. Few users of business graphics programs will spend the time filling in a bar chart or a symbol by adding color pixel by pixel. *VCN Concorde* does come with a color-fill function that allows users to paint

a bordered area all at once, so that the pixel-by-pixel paint capability is redundant.

■ The program does not come with a function key template even though it relies on the function keys for some of its most important and complicated commands.

■ The manual is extremely confusing, suffused with boxy graphics that make certain pages entirely uninviting.

As a business graphics program that performs basic graphing and text slide design, *VCN Concorde* is a good piece of software with some excellent attributes. But don't expect it to do more than that; it will let you down.

GraphStation

GraphStation, from Software Clearing House, is an intelligently built business graphics program that is strong on charting techniques. In some significant ways it consistently goes one step further than

some competing programs, but lacks the advanced design and animation capabilities found in others.

If you're looking for "blue-collar" software with integrity that gives you an honest day's work and then some, *Graph-Station* is a good choice. It has simplified the task of creating sophisticated charts to a fill-in-the-blanks process.

Taking data either keyed in or imported from *1-2-3* or *Multiplan*, *GraphStation* first builds a data template by leading you through the selection of information to appear on the chart. For instance, suppose you wanted to create a graph showing a company's revenue, costs, and profit for the years 1984 and 1985. First *GraphStation* asks you for the *x* axis label (year) and then the tick-mark labels for the *x* axis (1984, 1985). Then the program requests the first data set name (revenue) and then the number reflecting the initial tick-mark label (1984) and the initial data set name.

GraphStation has the ability to generate a Fourier curve that eliminates wildly fluctuating data in order to make the graph easier to read.

■ If you're looking for "blue-collar" software with integrity that gives you an honest day's work and then some, you'll find that *GraphStation* is a good choice.

(That, of course, would be 1984's revenues.) In fine fashion, you're asked to fill in 1984's costs and profits and the same information portraying the type of year 1985 was. Finally, this data is saved in its own file and then drawn by simply calling up a graph format—a system-supplied bar, line, or pie chart—or a modified format that you've designed.

POWERFUL EDITING This process of creating a chart from data is quick, easy, and comfortable. But it's in the editing mode, after all the data is input, that *GraphStation* truly displays its power. Like most other business graphics software, this program allows you to change fonts, styles, sizing, and the placement of elements on the screen, but its virtue is that it does this with the same simplicity used to create the chart in the first place.

The editing process offers a number of nice touches. There is a command called What Is Pick, which highlights the selected area to be edited just in case you lost your place. It does so by flashing a colored screen across that component. *GraphStation* gives you a large moving arrow, rather than a small cursor, to choose screen elements to be worked on.

GraphStation has other uncommon features. If you want to do what-if analysis with your chart, *GraphStation* can be told

to ignore, erase, or change specific data points and then produce a chart reflecting these numerical shifts. If a graph contains a lot of data that makes trends difficult to discern, you can tell the program to draw a running average of the chart.

GraphStation allows you to select data from more than one file, merge it, and then produce a graph from it. If a graph is made up of wildly fluctuating numbers—which makes reading its underlying storyline nearly impossible—you can request that *GraphStation* display a Fourier curve that eliminates radical changes in the data. When creating a chart from data carrying large numbers, *GraphStation* automatically edits this information into a manageable format for the graph. For instance, when I built a line graph showing U.S. wheat output from 1983 to 1986, *GraphStation* automatically graphed the data points, which ranged from 12,000 pounds to 56,000 pounds, as 6 tons to 28 tons.

LIMITED ASPIRATIONS *GraphStation* doesn't pretend to be anything more than a good, basic, business graphics program. That in itself is not a bad aspiration, but it means that the program is limited over the long term and will probably fall behind other business graphics software that use simple animation, motion, and feasts of color and activity.

It offers no library from which to choose predesigned pictures, icons, borders, and geometric shapes to add panache to graphics; it has no capability for movement and animation; and it can produce

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Just when you thought you'd seen everything in PC-based graphics, there's something you can't see: a sound track. *Show Partner*, Version 2.0, has a new option, the $1,195 TrueSound Card. It plugs into your PC's system bus and digitizes sound from a microphone or prerecorded source onto disk, at about 200K per minute. It plays back through an external (included) speaker or through an amplifier.

The sound tracks are stored in DOS files, and you have complete software control over which tracks play with which slides. *Show Partner*, already widely acknowledged as the animation program to beat, has the sound capabilities well integrated into its scripts. The recording software provides a complete tape recorder environment. You can set the volume level, go forward and backward, record, play, and erase. As a bonus, you can edit and even insert sounds in front of those already recorded.

For more information on the True-Sound Card (*Show Partner* edition), contact The Marketing Channel, Ltd., 120 E. Washington St., #421, Syracuse, NY 13202; (315) 474-3400.

—Bill Machrone

only a fairly weak slide show.

GraphStation has some quirks. To choose a command, you have to move a box over the function name in the upper-left-hand corner of the screen by pressing the Spacebar until you get to the command that you wish to highlight. This is time-consuming and unsatisfactory. *GraphStation*'s developers should have chosen the command selection method of simply typing the command's first letter.

Another eccentricity is the method used to pick the files to be in the slide show. In *GraphStation*, users identify these files "by exception" as the documentation says. This means that you must highlight those files that are not to be in the slide show and then *GraphStation*, by process of elimination, knows that the unidentified files are to be in the slide show.

In all, *GraphStation* is an excellent and easy to use business graphics program, but in the not-too-distant future, it will be surpassed by programs with more far-reaching capabilities that are already coming onto the market.

Jeffrey Rothfeder is a free-lance writer based in Wyckoff, New Jersey.

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F rom financial data to literature to horse trading, a mind-boggling array of data is available in hundreds of databases. These on-line libraries cover a wide spectrum of information, from general interest to the esoteric.

If you are a specialist in banking or chemistry, you could probably find the databases that suit your needs with a little research. You'll probably even have the time to learn the complex chain of commands that may be necessary to obtain data—or the money to hire somebody to do it for you. If you're a microcomputer enthusiast who only wants to communicate with other users and pick up the occasional public-domain program, then a single general-interest database system such as The Source or CompuServe will probably do.

But if your information needs are both broad and deep, you're likely to find yourself in a quandary. Finding the right sources can be both time-consuming and expensive. Unlike software, which you can usually test without considerable financial

Western Union's InfoMaster gives you easy access to hundreds of databases through one simple menu system. It's a bit slow and cumbersome, but for some researchers it's the best answer.

outlay, most professional on-line databases cannot be "sampled"; at best you can take a limited subscription. You then must learn how to search most effectively for the information you need, a process that can take many costly hours.

The Western Union Telegraph Co. has introduced an on-line database service that it believes could eliminate many of these difficulties. InfoMaster went on-line in October 1985 and is accessible through Western Union's EasyLink electronic-mail service.

InfoMaster gives EasyLink users access to about 720 on-line databases through major vendors that include BRS Information Technologies, Dialog Information Services, NewsNet, Benjamin InfoLine, SDC Orbit Search Service, Vu-Text Information Service, Questel, and TRW. The InfoMaster system acts as an intermediary between subscribers and vendors by interposing an elaborate menu system "mask." When you use InfoMaster to search for information, you never make direct contact with any other system. Info-Master passes your queries on to the database and brings you the result.

This "one-stop shopping" approach is a main selling point for InfoMaster. Managers who have neither the time nor inclination to wrestle with a complex database language or have computer-shy employees can successfully sign on to InfoMaster with little or no prior database experience. Individuals who need varied or eclectic information and require a large range of resources will also appreciate InfoMaster.

All subscribers to Western Union's EasyLink electronic-mail are automatically granted access to InfoMaster (although you can request that access be blocked to either EasyLink or InfoMaster). Once you have signed on to the system, you first exit EasyLink's electronic-mail service (which is where the system automatically places you). From there, you can enter several other Western Union services, including EasyLink's user directory, its own FYI database system, and InfoMaster.

If nothing else, InfoMaster is truly easy to use. It has a constantly present menu system and uses refreshing plain-English commands and explanations. At almost any point you can hit H to access an on-line, context-sensitive help file; if you are

really stumped, you can type SOS to call a "search specialist." Western Union keeps these technical experts available on-line 24 hours a day, 7 days a week. I sent an experimental SOS on a Saturday night and got an immediate and courteous response. Western Union also staffs a toll-free help number.

INFOMASTER-I InfoMaster offers three different search modes: InfoMaster-I (where, according to the menu, "We pick the database"), InfoMaster-II ("You pick the database"), and Company Name Scan.

The first choice is the simplest to use, and new subscribers will probably start there. InfoMaster-I is designed for users who have a fairly good idea of what they want but have no idea of where to go for it. It uses a careful and occasionally tedious menu system to slowly narrow down the scope of a search to the point at which the system has a good idea of which databases to access.

For example, I wanted a list of PC mailing-list management software. InfoMaster-I immediately gave me the choice of searching for a subject, person, place, or

organization. Once I chose subject, it presented eight categories: current events; business and economics; computer, science, and technology; medicine, allied health, and pharmacy; law, trademarks, and patents; social sciences and education; art, literature, and entertainment; and religion and philosophy.

From here, the list continued to slowly narrow. (If I had chosen to find a person, place, or organization, the narrowing process would have been slightly shortened. After one or two categorizing menu choices, I would have been asked to type in the person, place, or group I was interested in.) After two more menus, I was able to choose the single category of "computers," after which I was presented with more-specific contexts such as "home, business, and educational use" and "research and technical information." When I opted for the former I arrived at the first real decision of the session.

A GRAIN OF SALT Take InfoMaster-I's description in the main menu, "We pick the database," with a grain of salt. Once you have narrowed your options to a specific topic, InfoMaster presents you with a list of relevant sources from which to choose. A typical listing will allow you to select among popular magazines, books, trade journals, encyclopedias, and several related databases. It is worthwhile to note all the available sources; if your first choice doesn't manage to turn up the information you need, you can easily choose another.

Once the system knows exactly where to look for your data, it asks you to specify exactly what you are looking for. InfoMaster's search language is very simple, as these things go: it includes several common connectors such as AND, OR, and NOT, lets you use parentheses to group nouns and connectors—for example, JANE AND (GREY OR EYRE)—and uses a slash as a wildcard. It does not allow you to specify a time period or use greater-than/less-than comparisons.

Name and place searches are limited by the language as well. You can only specify a last name and two initials, so a search for somebody with a common last name can result in a large number of responses. Ac-

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NAME	TITLE

| COMPANY | |

| ADDRESS | |

| CITY, STATE, ZIP | |

| TELEPHONE | |

Mail to: InfoMaster, Dept. 501
9229 LBJ Freeway, Suite 234, Dallas, TX 75243   A79

*Respond now and receive a FREE full-color InfoMaster poster.

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CIRCLE 253 ON READER SERVICE CARD

```
PRESS   TO SELECT

1  InfoMaster-I.  We pick the database
2  InfoMaster-II.  You pick the database
3  Company Name Scan
4  InfoMaster instructions
5  Announcement: TRW Now Online
6  Help*
-) 1
```

```
PRESS   TO SELECT

1  Subject
2  Person
3  Place
4  Organization
8  Help
                                                      00:01
```

cording to an EasyLink representative, decisions about how to limit the search language were "editorial judgments"; an appropriate balance had to be struck between supporting specific search criteria and keeping the language simple and easy to learn.

It usually takes InfoMaster only a few minutes to complete a search. The system takes your information, dives into the data-

```
fitness for a particular purpose are made.  Any liability is limited to the
amount paid by the customer to Western Union.

Accessing network.(Standby).Connected.
Accessing Database Vendor......Completed.
Submitting Password...........Completed.
Selecting Database............Completed.

Each star equals one line
of retrieved data.  This may take
several minutes.

Occurrence  Search expression

     846  MAIL/
       0  AND
       0  MAIL: LIST
       0  SOFTWARE?

Nothing was retrieved.  No charge for this search.

Please wait...
                                                      00:04
```

base it has chosen, quickly picks up a listing of all the titles it can find that apply to your topic, selects the 10 or 15 most recent, and immediately resurfaces. You get no second chances—after you have confirmed that what is on the screen is what you are looking for, you are committed once and for all. After those first entries have scrolled past, you can look at the list again, view abstracts or full-text versions

InfoMaster's opening screen gives subscribers a choice between InfoMaster-I, InfoMaster-II, and Company Name Scan. Choosing InfoMaster-I (type 1 and Return) brings up the first of a series of menus, as shown in the lower portion of the screen.

of one or more (depending on what is available), order a hard copy of the document, or continue your search.

If your search turns up many references (and one of my more-generalized topics pulled in about 1,400), InfoMaster tells you how many items it found, picks up those first few, and then gives you the option of looking at the next set if you wish. But since InfoMaster has already left the database from which it culled those references, you must wait while it goes back again. And, of course, if you find the information you need and want to look at it in more detail, you must again wait while InfoMaster fetches the data.

This process can be time-consuming and is the major disadvantage to working with InfoMaster. According to a Western Union representative, that drawback keeps InfoMaster's fees relatively low: it can jump in and out of databases without accumulating on-line charges. I soon discovered that if a search produced more than 40 or 50 references, I was better off simply starting from scratch and trying to narrow my criteria a bit. (Unfortunately, you cannot return to redefine your original request without wading through InfoMaster-I's menus.)

Even an unsuccessful search can be useful: it produces a very informative list-

Once you have entered and confirmed a search request, InfoMaster begins its search. The text scrolling off the top of the screen here is a fairly standard liability disclaimer. InfoMaster keeps you informed of its progress as it searches through the database you requested, using asterisks to give you a general idea of how much data it has retrieved. If a search does not turn up any applicable listings, as here, InfoMaster will create an itemized listing of your search expression to help you revise your criteria.

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Business Computing Systems

ing of the number of occurrences of each separate item in your original request. You can then identify any words that might have interfered with the search. For example, a search for educational grants available for a young man from Africa that read EDUCATION/ AND (MALE OR BOY) AND AFRICA came up blank. The occurrence listing that followed showed that while there were four mentions of AFRICA and a couple of thousand for EDUCATION/, there were none for (MALE OR BOY). By starting over again and eliminating the phrase (MALE OR BOY), I was able to successfully complete the search.

SAVING TIME More-experienced users may become impatient with InfoMaster-1's constant prompting. The second choice on the main menu, InfoMaster-II, conducts its searches in the same manner but drastically cuts down on the initial menus by immediately asking you to name the database in which you want to search. Even newer subscribers can use this method by examining the Database Directory that Western Union sends with its Introduction Kit, which lists available databases by subject.

Western Union has also instituted a new GO command, which you can use at the main menu. By typing GO and a topic (for example, GO HISTORY), you can jump past most of InfoMaster-1's initial inquiry menus and start your search procedure sooner.

I found the easiest and fastest way to collect information was through the third main-menu option, Company Name Scan, which will search for either financial information or articles from news and trade literature about specific companies. Not only is the initial process quicker—you type in your search request without the usual procession of menu choices—but Company Name Scan is also a more efficient way of obtaining data from multiple sources.

For example, I decided to look for news of Ziff-Davis Publishing Co. InfoMaster immediately initiated a search and then listed 12 sources, including article abstracts from major business magazines, Moody's Corporate News, Predicasts Marketing and Advertising Reference Service, and Standard & Poor's News. It also listed the number of times Ziff-Davis was

DOZENS OF DATABASES
The possibilities with InfoMaster, if not exactly endless, are pretty broad.

The approximately 720 databases that InfoMaster can access range from accounting to geography to law to water. Western Union supplies an InfoMaster Database Directory that lists all the databases alphabetically by subject. The following excerpts from the directory give you an idea of the variety of topics you can research with InfoMaster.

Adtrack
Aerospace Database
Africa News
American Banker
American Men and Women of Science
Books in Print
Catalyst Resources for Women
Chemical Exposure
Coffeeline
Daily Petro Future
Drug Information Fulltext
Editors Only
Electronic-Mail News
Entrepreneurial Manager's Newsletter
Exceptional Child Education Resources
Fearless Taster

Food Science and Technology Abstracts
Foundation Directory
Frost & Sullivan's Political Risk Newsletter
FTC:Watch
Harvard Business Review
Japan Computer Industry Scan
Manufactured Housing Newsletter
Micro Moonlighter
Mobile Phone News
National College Databank
National Newspaper Index
Occupational Safety and Health
Online Chronicle
PACS & Lobbies
PR Newswire
PsycInfo
Rubber and Plastics Research Abstracts
Silicon Mountain Report
Sludge Newsletter
Surplus Alert
Trademarkscan
Transportation Research Information
U.S. Census Bureau
Wall Street Book Store
Washington Beverage Insight

mentioned in each source, and the type of data available (abstracts, full-text documents, or bibliographies).

As in InfoMaster-1 and -II, once I had chosen a resource the system returned to that vendor to pick up the requested information. But unlike the two other segments of InfoMaster, which automatically return you to the main menu once you have viewed the search results, Company Name Scan took me back to my Ziff-Davis source list so that I could obtain additional information about the same company without having to start from scratch.

Not surprisingly, this fast and easy Company Name Scan function has been acclaimed by InfoMaster customers. In an effort to apply its efficiency to other segments of the service, Western Union plans to institute a method of limited cross-vendor searching in which customers will be

able to scan different databases from different vendors for a single topic, as in the Company Name Scan.

SAVING MONEY Another of InfoMaster's selling points is its cost-effectiveness. Western Union charges InfoMaster customers 15 cents per minute for connect time and $8 for each successful search, with several additional charges such as $6 for viewing items beyond the initial search and $6 to $25 surcharges for accessing a few specific databases. In the event that a search results in no applicable responses, the charge for that search is automatically withdrawn.

For example, I wanted to read about the recent restructuring of the CBS News Division. With InfoMaster-II, I accessed a newsletter, called *Communications Daily*, through NewsNet. A search based on the

```
Heading # 10

000365          010952000293
BUXPD
      Britz Publishing Inc
      12741 Capitol Towers
      Jackson MS  39201
      (601)354-8882
  CONTACT:  Leon Stewart Software Mktg. Mgr.


PRESS    TO

  1      Review Headings again

  2      See full text article    (need Heading #, no additional charge)

         Option to see further records not available

  4      Start a new search (or SOS)

  5      Leave system
                                                                    00.31
```

topic CBS News turned up 28 items. I viewed all 28, found a full-text article on the topic I had chosen, and viewed it. The entire process took about 8 minutes and cost $15.20.

Interestingly enough, when I tried to find the same information using InfoMaster-I and the Company Name Scan, I found myself viewing different, although equally

appropriate, data for much the same time spent but for more money. An 11-minute InfoMaster-I search turned up 32 items through the PTS/PROMT database via BRS Information Technologies. PTS/PROMT carries a $6 surcharge, and I had to view the items in three lists; the cost for the complete process came to about $26.65.

An example of an InfoMaster entry listing. Each entry is identified by a number that you would then use to retrieve it for more-detailed information. Once you have viewed your listing, InfoMaster gives you several options: you can review the choice, see any remaining entries, or retrieve full-text documents or abstracts.

I was also able to access PTS/PROMT through the Company Name Scan. This time, I searched for the company name CBS. The search took about 9 minutes; the cost would have been almost exactly that of InfoMaster-I, but I was also able to read through a few abstracts from Standard & Poor's News, which took another 4 minutes.

InfoMaster's method of dropping into a database, pulling out a short list of available information, and then resurfacing can be tedious at times and even frustrating on long searches. The limitations of the search languages don't make its operation any quicker either. But if the system is slow and somewhat cumbersome, it is certainly sure and easy enough for almost anyone to handle.

Professional information specialists and hard-core market researchers don't need a service like InfoMaster, and corporations with very specific data needs would probably be best off pinpointing and subscribing directly to the appropriate database. But users who need access to a variety of resources and who would prefer not to struggle with highly sophisticated on-line databases will find InfoMaster a relatively inexpensive and welcome alternative.

Barbara Krasnoff is a frequent contributor to PC Magazine.

```
Press (return) to see
your search results...-)

News and trade literature profile for: ZIFF DAVIS

PRESS    TO SELECT            Occurrences   Data Type

  1     ABI/INFORM.............         24    abstracts
  2     Magazine ASAP..........         99    full text
  3     Management Contents....         12    abstracts
  4     Moody's Corporate News - U.S...   3   full text
  5     National Newspaper Index....    54    bibliographic
  6     Newsearch..............               bibliographic
  7     PTS Marketing & Advertising...  97    abstracts
  8     PTS New Product Announcements... 95    abstracts
  9     PTS PROMT..............          37    abstracts
 10     PTS Regional Business News...    9    full text
 11     Standard & Poor's News...        4    full text
 12     Trade & Industry ASAP...       174    full text
 13     Explanation of databases
 14     Main menu
                                                          00.31
```

The Company Name Scan function allows you to view all the resources in which your company appears, including how many references are available and the forms those references take. Once you have viewed the available data from one of these resources, InfoMaster returns you to this list in case you want to continue to research the same topic.

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CIRCLE 187 ON READER SERVICE CARD

M*A*S 90: WELL BEYOND ACCOUNTING BASICS

Back in 1982, State of the Art introduced a successful family of PC-based software for small business accounting. Although capable, it was based upon the less successful UCSD p-code operating system rather than PC-DOS. Then in early 1986, State of the Art launched its PC-DOS–based Master Accounting Series. *M*A*S 90*, as it is called, is a highly competitive product combining clear, concise screen formats, polished documentation, an unusually capable Payroll module, and an outstanding facility for producing custom reports.

At press time, the *M*A*S 90* accounting series consisted of four accounting modules: General Ledger, Accounts Receivable, Accounts Payable, and Payroll. The series also includes a utility module, Library Master, which contains the system utilities, installation procedures, and the nifty custom report-writing facility. Five additional modules—Inventory Management, Sales Order Processing, Purchase Order Processing, Job Cost, and Bank Reconciliation—are due for release before the end of the year.

We reviewed the single-user version of *M*A*S 90* using an IBM PC AT. However, State of the Art also sells a network version of *M*A*S 90* as well as a multiuser version for a single CPU. The network version is based on Novell's *NetWare*. The

multiuser version requires the Thoroughbred Operating System and, as such, is transportable to other hardware configurations, including minicomputers.

The software requires a printer that can print 132 characters; compressed print on a narrow printer will suffice. You can use a utility program to enter the control characters that switch your printer between compressed and standard character sets. And, if you have a monitor that can display 132 characters on a single line, *M*A*S 90* allows you to view "wide-carriage" reports on your screen.

INSTALLATION Installing the *M*A*S 90* system is a snap, but first you'll need to determine if you have enough hard disk space available to load the modules and create the data files. The program supplies you with some worksheets to help you calculate the disk storage necessary for each application. Completing the worksheets for each application tells you how much disk space you'll need on your hard disk to load both program and data files.

If you can type A:INSTALL A: C:, you can install the *M*A*S 90* software. First you load the Library Master files and then the applications files; then you are ready to implement your accounting software. As usual, this amounts to establishing your financial accounts; entering initial balances;

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■ **THE PRICE WATERHOUSE REPORT**

setting up your customer, vendor, and employee records; and so on. Here again, worksheets supplied with the documentation help you organize your work (see Figure 1).

You can maintain records for as many companies as your hardware will allow. As you attempt to sign on to an application

for the first time within a new company, you'll be prompted for the file sizes you developed using the disk storage calculation worksheets. Entering this information will cause the necessary files to be created on your hard disk. When you complete this step, you're ready to begin entering your financial data.

Startup Worksheets   G13

M·A·S 90™ Accounts Receivable Sales Code Worksheet

SALES CODE: _ _ _ _ _ (6)

DESCRIPTION:

_ (30)

POST TO G/L BY DIVISION (Y/N):*   Y_ N_

G/L SALES ACCOUNT: _ _ _ _ _ _ _ _ (9)**

G/L COST OF SALES:*** _ _ _ _ _ _ _ _ (9)**

G/L INVENTORY ACCOUNT: _ _ _ _ _ _ _ _ (9)**

CALCULATE SALES TAX? (Y/N):   Y_ N_

CALCULATE COMMISSION? (Y/N):   Y_ N_

UNIT OF MEASURE: _ _ _ _ (4)

STANDARD COST: _ _ _ _ _ _ _ . _ _ (9)

STANDARD PRICE: _ _ _ _ _ _ _ . _ _ (9)

ENTER DESCRIPTION?(Y/N):   Y_ N_

ENTER COST AMOUNT?(Y/N):   Y_ N_

* *The POST TO G/L BY DIVISION: question will be asked only if you divisionalized your Accounts Receivable and indicate 2 or 3 as the G/L SEGMENT to use for A/R SALES POSTING in Accounts Receivable Options.*

** *If you are not integrating with the M·A·S 90™ General Ledger, account numbers are seven digits maximum.*

*** *The Cost of Sales and Inventory account numbers will be asked only if you answer Y to the Cost of Sales question in Accounts Receivable Options.*

Figure 1. *This sample startup worksheet from the M*A*S 90 documentation package is used to help you organize your work before you begin data entry. Worksheets to help you calculate your hard disk storage needs are also included with the program.*

■ THE PRICE WATERHOUSE REPORT

GENERAL LEDGER To set up the general ledger, you must first respond to some system questions regarding the number of accounting periods (1 through 13) you wish to use, the current accounting period, the current calendar year, and each accounting period's ending date (which needn't be a month-end date).

Next, define the size and structure of your account number. A M*A*S 90 general ledger is built upon a multisegmented account number that gives you an impressive level of flexibility and sophistication in financial reporting. Account numbers contain from three to nine alphanumeric characters that can be divided into one, two, or three segments (that is, *xxxx-xx-xxx*). This versatile account structure allows you to designate prime and subaccounts for classifying revenues, expenditures, assets, and other factors (often called natural or "object" accounts). You can also define an account segment to classify items as to department, division, profit center, and so forth.

Another powerful feature of M*A*S 90 uses the custom report writer to consolidate the accounts for multiple companies that have different charts of accounts. It may take you some time if your accounts are complex, but if you need to consolidate the accounts of two companies in very different businesses, this facility can be quite useful.

In establishing each account, you can enter current-year activity, budgets, and prior-year activity by period. Once you have developed a chart of accounts and financial reports for one company, you can copy it over to a new company, saving some time.

General journal entries can be entered as one-time or recurring entries. For each journal transaction, you can enter the posting date, a reference, and a two-character "source," for example, CR for cash receipts (see Figure 2). An account number and a 30-character posting comment can be included with each line-item debit or credit. Posting comments will default from the line above, but you may override them—a handy feature. A distribution balance field displays the difference between the debit and credit totals, and this field must equal zero before you can leave this screen without deleting the batch.

```
COMP CODE: ABC      COMPANY: ABC DISTRIBUTING AND SERVICE CORP.    D5/31/90
LN: 3/50            PROGRAM: GENERAL JOURNAL ENTRY                 HD: 1/49

POSTING DATE:  D5/31/90
REFERENCE:     ABC105

SOURCE JOURNAL: JE
REVERSING DATE:                              DIST BALANCE:            .00

LINE   ACCOUNT NO.     POSTING COMMENT                  DEBIT      CREDIT

 1     175-00-00       Trucks                          25100.5D
                       Purchase Ford 5 Ton Truck
 2     275-01-00       Loan payable to Bank 1                     2000D.00
                       Install Loan 1054-254 Ford Trk
 3     101-03-00       Cash in bank — savings                      5100.5D
                       Down payment on Ford 5 Ton Trk


    ENTER LINE NO. TO MODIFY (1-3, <F1D> next page, <RETURN> to end);____
```

Figure 2. *The versatile General Journal accepts both one-time and recurring entries. For each transaction, you can enter the posting date, a reference, and a two-character code to indicate the "source" of the transaction. A 30-character comment can accompany each debit/credit entry.*

Unfortunately, the program lacks a facility for putting an out-of-balance batch on hold and a batch total field. Also, since the system assumes that entries are debits, you must enter a minus sign (P) to identify a credit. The posting date defaults to the system date, but you may change it. You also have the option of entering a "reversing date"—a future date at which the system should automatically produce a transaction equal and opposite to the one you're currently entering (a common requirement for certain period-end transactions).

The system allows you to maintain (or change) these transactions until they have been posted. Thus you can enter your data, print the general journal, and make any necessary changes before they are posted to the general ledger.

Once a batch is entered and in balance, you can Escape the screen, terminating the batch. You must print and update the general journal (a listing of transactions not yet posted to the general ledger) as well as the Daily Transaction Register before the jour-

nal transactions will be reflected in the General Ledger Trial Balance and other financial reports.

The system produces numerous standard reports, including the General Ledger

Worksheet, Budget and History, Trial Balance, Balance Sheet, and five different forms of Income Statement. Presumably, the bottom line is the same on all five! In addition to these standard reports, the sys-

The Price Waterhouse Team

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John R. Hunter *is a Price Waterhouse senior consultant, also based in the Sacramento office. He specializes in mini and micro computer systems.*

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tern has a custom financial-reporting feature that allows you to choose any combination of period-to-date and/or year-to-date data by amount and/or percentage for the actual amount, budget amount, budget variance, prior-year amount, prior-year variance, and prior-period amount.

The custom financial reporter is easy to use and quite capable but does not allow the use of wildcards. This is unfortunate. If you add a new financial account to the general ledger, you'll need to hard-code it into

> ■ The General Ledger
> module contains a simple
> graphics facility for
> doing bar charts based
> upon financial account
> data, but don't expect
> too much from this.

each of your custom financial reports.

The General Ledger module also contains a simple graphics facility for doing bar charts based upon financial account data, but don't expect too much from this. We were, however, impressed with the General Ledger Analysis—a concise recap consisting of a summarized income statement, balance sheet, and 13 vital financial ratios for the current period, the prior period, and year-to-date.

The system allows you to post to future periods. To post to a prior period, you must reset the system date to that previous period, make the desired entries, and then reclose each period up to the current one. This requires you to reexamine all general ledger accounts and can be quite time-consuming.

ACCOUNTS PAYABLE The Accounts Payable module offers many features not often found in microcomputer accounting packages. For example, when setting up vendor master file information, you can enter a vendor reference number—a 15-

character field by which the vendor identifies your company. The entry in this field can be printed on the accounts payable check stub along with the vendor number and name. In addition, you can assign a

30-character comments field to each vendor and use it to record inquiries by vendors about their accounts. Another feature, a 10-digit vendor sort field, lets you dictate the sequence of certain accounts payable

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CIRCLE 470 ON READER SERVICE CARD

■ The Accounts Payable module gives you both one-time and recurring invoice processing capabilities.

reports. Still another feature lets you identify vendors as temporary. If, at month-end, vendors have a zero balance, they will be removed from the system. You can also generate a 1099 form for both individuals and businesses.

The Accounts Payable module gives you both one-time and recurring invoice processing capabilities. Based on the invoice date and the individual vendor's terms (which you record for each vendor), the Invoice-Processing function automatically calculates the due date, discount due date, and discount amount. Both the Invoice Register and the Transaction Update functions must run before an invoice will impact a vendor's balance. Either a vendor or an individual invoice can be put on hold to prevent payment.

Reference to open invoices is available via the Aged Invoice report or on-line through the Vendor Maintenance/Open Invoice Inquiry screen. This screen displays all invoices with balances as well as any net zero-balance invoices entered during the current period. Invoice number, date, amount, open balance, check date, and check number are tracked.

One note of caution: If multiple (that is, partial) payments are made on an individual invoice, only the most current check date and number will appear. The system does not issue a Vendor Trial Balance report, nor does the check register include invoice numbers paid. The lack of such information could slow the process of reconciling individual vendor accounts when or if it became necessary.

Invoice payment selection allows you to specify a range of vendors, though you would normally want to pay selected invoices for all vendors. However, you are

given the option of selecting only invoices with an available discount, or you can instruct the system to always take discounts, disregarding the discount date. (Sounds like the system used by all your customers, right?) The system will also accept manual checks with associated account distribution information.

The Accounts Payable module contains numerous reports, including an Aged In-

STATE OF THE

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voice report, Vendor Mailing Labels, 1099 forms, and an Accounts Payable Analysis—a neat recap of your payables that analyzes outstanding invoices for their age and amount and compares them to the previous 6-month averages. We'd like to see a trial balance for each vendor, a period-to-date transaction register, and a period-to-date summary of the postings to the general ledger.

ACCOUNTS RECEIVABLE The Accounts Receivable module is designed to function either as a standalone package or as an integral part of the M*A*S 90 Sales Order Processing and Inventory Management modules. As is the case with other M*A*S 90 accounting modules, it integrates nicely with the General Ledger. The Accounts Receivable module has also been designed to accept invoice data directly from the Sales Order Processing module (yet to be released).

■ **Commission rates can be defined for each salesperson and can be based upon either net invoice or gross profit amounts.**

Implementing the Sales Order Processing module allows you to associate a separate shipping address with each order. You can also use a "customer type" field to group your customers for reporting purposes.

Each customer invoice can be entered under either the open item (payments applied to specific invoices) or balance forward (payments applied to a single revolving balance) method of invoicing. Similarly, you can assign each customer appropriate discount and finance charge rates.

One feature of the Accounts Receivable system is unique and very useful for those who pay their sales personnel on a commission basis. The salesperson and commission reporting features of the M*A*S 90 software allow for the accumulation and reporting of sales-related commissions. Commission rates can be defined for each salesperson and can be based upon either net invoice or gross profit amounts. Also, you can opt to pay commissions on only paid invoices—a smart feature we don't think you'll find in comparable software.

Recurring invoices can be set up for customers as required. In fact, you can group these recurring invoices into as many as five billing cycles (weekly, monthly, quarterly, and so on). To establish a recurring invoice, you specify the customer, billing cycle, shipping and billing terms, and the starting and ending dates for the invoices. Once established, you simply select a special function to generate the billing cycle's recurring invoices.

The designers of this software were obviously concerned with real-world efficiencies when they put together the invoicing routines, and this is clear from the ease with which you can set up new or one-time customers during the invoicing process. If you enter an invoice for a customer who is not on file, a simplified Customer Maintenance screen appears, allowing you to enter the minimum information necessary to process the invoice. A ''temporary customer'' flag identifies these as short-term customers, and they will be automatically removed from the system at the close of the current period if they have a zero bal-

■ **The designers of this software were obviously concerned with real-world efficiencies when they put together the invoicing routines.**

ance. Obviously, care must be taken in this regard. We don't know anyone in business who likes to think of a customer as temporary. Watch that flag and hang onto those customers!

The Invoice Entry function automatically calculates due dates, discount due dates, discount amounts, and sales commissions. Another useful feature of the invoicing process lets you enter multiple comments and miscellaneous charges for each invoice.

The system offers several additional reports to help manage your customer accounts. Among them is a Billing Statement (with promotional and/or dunning messages), Aged Invoice, Cash Expectations, Salesperson Commission, Finance Charge Journal, and an Accounts Receivable Analysis (as with payables, a neat summary of the receivables account).

One distinguishing feature of the M*A*S 90 software lets you customize the format of your invoices, mailing labels,

and statements. The package comes with standard formats for each report, but you can use a Form command to include or exclude them and move applicable data as desired.

PAYROLL The M*A*S 90 Payroll module is very flexible and contains features not found in most comparable products. Chief among these is the ability to process earnings for more than one state or local

tax jurisdiction for each employee. The system calculates the appropriate taxes for each jurisdiction, deducts them from each paycheck, and prepares W2 and 941 reports with wage and tax information listed by state and locality. Another key feature is the ability to "departmentalize" the payroll system. Employees can be assigned to departments, thus distributing the salary and employer tax expense for each employee to departments as appropriate. This enhances your ability to create informative cost reports.

> ■ A feature for any business that requires tip income reporting is the ability to calculate taxes and generate reports for tip income.

A mandatory feature for any business that requires tip income reporting is M*A*S 90's ability to calculate taxes and generate reports for tip income. The system automatically deducts taxes from taxable tips reported, adjusting the net pay amount of the payroll check. If the total taxable wages are too low, the software will automatically calculate and apply the differential necessary to bring an employee's wages up to a minimum wage that you establish.

M*A*S 90 has all the reports you'd expect from a payroll system: employee master lists, tax table lists, earnings and deduction registers, check registers, quarterly government reports, and many more. In addition, the system has several management-oriented summary reports: Earnings, which shows each employee's quarter-to-date and year-to-date earnings by type of earnings; Deduction (similar to Earnings); Vacation/Sick Leave Analysis; and Workers' Compensation.

Like the Accounts Receivable and Accounts Payable modules, the Payroll module has a useful form design utility that al-

lows you to customize the format of such things as payroll checks, employee mailing labels, 941s, and W2s. The system comes with standard formats for each report but also allows you to modify the print layouts to fit your specific needs.

The Payroll module even includes a few features to support you in the personnel management area. The employee data maintained by the system includes hire,

■ The employee data maintained by the system includes hire, termination, and review dates along with comments for each date.

termination, and review dates along with comments for each date.

The employee data bank also contains an emergency telephone number and contact name that can be used in the event of an accident. Entering a termination date will automatically suspend the creation of payroll checks for an employee, and the employee record will be automatically removed from the system at the end of the year (after W2 forms have been generated, of course).

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LIBRARY MASTER You must purchase the Library Master module in order to operate the *M*A*S 90* system. This module includes the system utility disks, software installation and setup procedures, password security instructions, and system utilities such as initial file sizing, data file resizing, an error log report, and file analysis and repair utilities.

The Library Master also includes an ad hoc report writer called the Report Master. This reporter, which lets you create and store custom reports, is about the best we've seen in a PC-based accounting product. Supply the name of the file from which you wish to extract data, and the fields within that file are displayed before you. You then indicate the fields you wish to include on the report, which fields should be sorted, the order in which you

■ **Your custom report can be displayed on the screen or sent to the printer or to a data transfer file.**

want the fields arranged across the page, whether or not numeric fields should be totaled, and the starting and ending range for each field. You can define up to nine sort priority levels, each of which may be in either ascending or descending order. If you are using totals, subtotals will automatically print whenever any of the data fields used to sort the report change from the previous line. You can specify two 40-character title lines, as well as all column headings. Your custom report can be displayed on the screen or sent to the printer or to a data transfer file. Data transfer file types include text format (to use with word processing software), database format (to use with *dBASE III*), and DIF (Data Interface Format—to use with, say, Lotus's *1-2-3*). Procedures for transferring data from *M*A*S 90* into *dBASE III* or *1-2-3* are well documented and easy to use.

PASSWORDS *M*A*S 90* is equipped with a well-designed three-level password security system. Users are assigned a three-digit user code and an eight-digit password. Both the user code and the password must be entered correctly to gain access to the master menu. Users are then granted access only to certain companies and to selected application choices within a company. For example, a specific user may be given access to all application

choices within company ABC, no access to company DEF, and access to only the General Ledger Journal Entry function of company GHI. This password protection scheme should meet the security needs of most companies for whom M*A*S 90 is appropriate.

Documentation is one area where the term *state of the art* takes on meaning. The M*A*S 90 manuals are among the best that we've ever seen. They are comprehensive, detailed, and helpful. Besides containing pictures and explanations of all available screens and reports, they describe the meaning of each and every prompt. The discussion for each prompt also includes flowcharts (both system overview and detailed procedure charts) and procedure checklists (for daily, weekly, and monthly activities or those within some other interval of time).

■ **Documentation is one area where the term *state of the art* takes on meaning. The M*A*S 90 manuals are among the best that we've ever seen.**

Two key sections in these manuals are Helpful Hints and Reference. Helpful Hints explains how and why you might best use some of the system functions. It also contains a discussion of how each module integrates with the other M*A*S 90 modules.

The Reference section provides a detailed explanation of every entry and editing feature used throughout the M*A*S 90 programs. It also contains a helpful glossary of terms and a detailed and extensive discussion on customizing forms for the individual modules.

TAKE A LOOK State of the Art has taken off to an impressive start in putting together a top-notch broad-based accounting product, notable for its ease-of-use. We hope the remaining modules in its accounting product line will be as capable as its initial M*A*S 90 offerings. If you're looking for a PC-based accounting package for your business, this software is one alternative you should explore.—G. William Dauphinais, Patrick F. Fitzhenry, and John R. Hunter

PC PRODUCTIVITY
MAGAZINE

■ PC LAB NOTES: THE DOS FIND COMMAND   ■ TOM SHELDON

FILTERING FILES WITH FIND

A handy DOS utility for a variety of tasks, FIND lets you search through files, extract data, pipeline output, and even count program lines.

Despite the availability of large numbers of user-friendly and powerful applications programs, many tasks can still be accomplished just as well (or better) by working directly at the nuts-and-bolts DOS level. In this article I'll show you how to take advantage of one of the more useful but often ignored DOS commands: FIND. While most of the FIND tips and techniques I'll be describing here are designed primarily for hard disk users (they tend to run slowly on floppy disk systems), that should not stop anyone from experimenting.

WHAT IS FIND? FIND.EXE is one of the three "filters" included in DOS 2 and DOS 3. (The other two are SORT.EXE and MORE.COM.) A DOS filter takes its input from one source (one or more files in the case of FIND), processes it, and then outputs the modified data (to the screen, printer, or to a new file). The three filters are "external" commands in that they have their own filenames (unlike DIR or COPY) and must either be located in your current directory or be listed on your DOS PATH.

The syntax for using FIND is

```
FIND [/V][/C][/N] "string" filename ...
```

If you simply type the FIND command, followed by a defined string (a series of characters surrounded by quotes) and one or more filenames, DOS will display every line in the file (or files) that contains the string. You must type the string to be found exactly, however: FIND is case sensitive and will not find "SMITH" if you ask it to find "Smith". You can specify a path before the filename if the file you wish to search through is in another directory. (You can also specify the path to the FIND command; however, in all examples shown here, I'll assume FIND.EXE is in your current directory or on your PATH.)

The /V, /C, and /N parameters are command "switches" that tell DOS how you want to display information that it finds. They work best when searching single files. The /V option will display all lines in a file that do *not* contain the string you specify. Assume, for instance, that you have a file, SPEECH.DOC, that contains a number of single-line comments that are intended for your own use and that should not be displayed or printed in the final document. If you have preceded your comments with a character such as the asterisk, you could then display all lines in the file except those so marked, by entering the command

```
FIND /V "*" SPEECH.DOC
```

You could also print the file, excluding your comment lines by redirecting the normal screen output to the printer, with the following:

```
FIND /V "*" SPEECH.DOC > PRN
```

The second command switch, /C, displays a count of the number of lines containing the string you specify. This switch has limited use with document and text files, for it counts only the lines where the string appears—even if the string appears more than once on a line—and so is not a word-counting device. It can be cleverly used in data management applications, however. For example, you could create a file listing the various items in your entire household inventory and,then use the command to count the number of similar items, like "DISH", "LAMP", or "MER-CEDES".

The /N switch displays the line number containing the string of text you specify. This comes in handy if you are trying to locate all occurrences of a word or name that you want to change or make reference to in an index, for example.

PRODUCTIVITY

DATA FILES While FIND is useful to the writer, it really shows its strength when used as a search tool on data files. Your data files can contain any kind of information, such as inventories, price lists, mailing lists, phone numbers, or any information that you need to search and sort. In the examples used below, red, blue, and black widgets in either round or square varieties are listed in an inventory file called PART-LIST.DAT, which is shown in Figure 1.

Note that all items in the file shown in Figure 1 have been entered in capital letters. This will eliminate any problems caused by FIND's case sensitivity, as long

PART#	SIZE	WEIGHT	COLOR	SHAPE
45-67	10	25	RED	ROUND
45-68	10	25	RED	SQUARE
45-69	12	30	RED	ROUND
45-70	12	30	RED	SQUARE
46-14	14	30	BLUE	ROUND
46-15	14	35	BLUE	SQUARE
46-16	16	35	BLUE	ROUND
46-17	16	35	BLUE	SQUARE
47-36	18	35	BLACK	ROUND
47-37	18	40	BLACK	SQUARE
47-38	20	40	BLACK	ROUND
47-39	20	40	BLACK	SQUARE

Figure 1: *PARTLIST.DAT, a sample database for using FIND.EXE.*

> ■ While FIND is useful
> to the writer, it really
> shows its strength when
> used on data files.

as you enter your search strings in upper case.

Now assume that you want to review the descriptions of the round parts. The following command

    FIND "ROUND" PARTLIST.DAT

produces the list

    ---------PARTLIST.DAT
    45-67 10 25 RED   ROUND
    45-69 12 30 RED   ROUND
    46-14 14 30 BLUE   ROUND
    46-16 16 35 BLUE   ROUND
    47-36 18 35 BLACK ROUND
    47-38 20 40 BLACK ROUND

You can be even more specific as to the information FIND will display by using FIND to filter the output several times. Suppose you are looking for a round part that has a weight of 35 pounds. The following command redirects the round parts listing above into a file called TEMP .DAT, which can be then be searched further.

    FIND "ROUND" PARTLIST.DAT > TEMP.DAT

The next step is to search the TEMP.DAT file for the second keyword search string, "35":

    FIND "35" TEMP.DAT

The following list is displayed on the screen:

    -----TEMP.DAT
    46-16 16 35 BLUE   ROUND
    47-36 18 35 BLACK ROUND

A more convenient way to accomplish the same task is shown below. Here the two commands above are combined into a single command by using the DOS piping feature. The output of the first FIND is "piped" directly into the second FIND.

    FIND "ROUND" PARTLIST.DAT | FIND "35"

The piping feature of DOS allows you to perform other useful things with the FIND command. For instance, the list of round parts can be sorted by color using the DOS SORT command. SORT requires the column number you wish to sort on; in this example the color of each widget starts in column 20, so the command takes the form:

    FIND "ROUND" PARTLIST.DAT | SORT/+20

The FIND /V switch allows you to list all lines in a file except those containing the string you specify. You can use this feature with the PARTLIST.DAT shown in Figure 1 to show all lines except the ones that contain the string "RED" by entering

    FIND /V "RED" PARTLIST.DAT

Similarly, you can refine the search to eliminate RED items and extract the ROUND ones from the remainder by simply entering

    FIND /V "RED" PARTLIST.DAT | FIND "ROUND"

The output will be

    ---------PARTLIST.DAT
    46-14 14 30 BLUE   ROUND
    46-16 16 35 BLUE   ROUND
    47-36 18 35 BLACK ROUND
    47-38 20 40 BLACK ROUND

To print any list produced by FIND and SORT, you can add the output redirection feature to send the screen display to your printer instead, as

    FIND "ROUND" PARTLIST.DAT > PRN

A BATCH FILE In the examples above, FIND was used in single or combined commands to produce a specific output. The batch file SEARCH.BAT listed in Figure 2 illustrates a way to automate the use of FIND. It lets you enter as many keywords as you wish, and they do not have to be placed within quotation marks. The batch file will successively break your data file down into smaller and smaller parts and will report only when *all* the keywords are found for the same item(s). (Note: Do *not* type in the line numbers; they are present only for the explanation to come.)

To explain how the batch file in Figure 2 works, assume that you have entered

Unforgettable.

PRODUCTIVITY

■ PC LAB NOTES

```
          SEARCH.BAT
1    ECHO OFF
2    CLS
3    IF "%1" == "" GOTO NONAME
4    IF "%2" == "" GOTO NOKEYS
5    FIND "%2" %1 > TEMP.DAT
6    SHIFT
7    IF "%2" == "" GOTO NODATA
8    :LOOP
9    FIND "%2" TEMP.DAT > TEMP2.DAT
10   COPY TEMP2.DAT TEMP.DAT
11   SHIFT
12   IF "%2" == "" GOTO NODATA
13   GOTO LOOP
14   :NONAME
15   ECHO NO FILE NAME SPECIFIED. START OVER
16   GOTO END
17   :NOKEYS
18   ECHO NO SEARCH CRITERIA SPECIFIED. START OVER
19   GOTO END
20   :NODATA
21   ECHO SEARCH COMPLETE. TEMP.DAT NOW HOLDS RESULTS
22   TYPE TEMP.DAT
23   :END
```

Figure 2: SEARCH.BAT allows you to automate the use of the FIND filter by entering multiple search criteria. Do not enter the line numbers on the left.

SEARCH PARTLIST.DAT SQUARE BLUE 35

This should produce the output

```
--------TEMP.DAT--------
46-15    16    35    BLUE
46-17    16    35    BLUE    SQUARE
```

[Note: With some versions of DOS (2.0 or later is required) and on some machines, the SEARCH.BAT file will display the error message, "Intermediate file error during pipe." Ignore this message: TEMP.DAT does hold the results, as indicated. Be aware also, however, that SEARCH.BAT is incompatible with some common memory-resident programs, so make sure your AUTOEXEC.BAT is "clean."—Ed.]

Referring to the line numbers I've added to the batch file (for reference only), the first two are standard setup commands that turn echo off and clear the screen. Line 3 uses the batch file IF statement to check for the presence of a filename, (in this case, PARTLIST.DAT) in the command line. In the example above, PARTLIST.DAT was entered as the filename so processing continues on line 4. Note that if a filename had not been entered, one of two things

would happen: the batch file would jump to the label :NONAME, or a "file not found" error might occur.

When given a filename to be searched, line 4 assigns variable "%2" to the first of the keyword criteria. Once again, if none is supplied, you jump to an error message at label :NOKEYS. Since, in this example, you supplied one (SQUARE) in line 5, the FIND command applies it to the filename, directing the output to a temporary file called TEMP.DAT. Line 6 then uses the batch file command SHIFT to reassign the next keyword (BLUE) to parameter "%2".

If there is no second keyword, the jump (line 7) is to :NODATA at the end of the program. If there is a second keyword, however, the program enters a loop and searches the contents of TEMP.DAT for the additional string, directing the output to TEMP2.DAT (line 9). TEMP2.DAT is then copied as TEMP.DAT, another shift is made, and the loop recycles until no more search criterion words are found. If at any point one of the search criteria is not met, the contents of TEMP.DAT at the end of the process will be nil. The DOS

■ PC LAB NOTES

ADVANCED FIND TECHNIQUES

If you have a hard disk, FIND can be helpful in some unexpected ways.

FIND is one of the most versatile DOS commands. When combined with other DOS commands and features, it can track down long-forgotten files, scan across hundreds of files in subdirectory for matching strings, and even give you a rudimentary address book with an automatic lookup feature.

Advanced FIND uses almost presuppose a hard disk. Hard disks can store so much data and contain so many subdirectories that it's easy to lose track of what's where. While FIND can be useful with a floppy system, you'll be far more productive with a drive C:.

DEEP-ROOTED CONFUSION Most users clutter their root directories with dozens of miscellaneous or temporary files. The ideal root directory, however, should contain only your first level of subdirectories and the critical files COMMAND.COM, CONFIG.SYS, and AUTOEXEC.BAT. This way, typing DIR \ will give you an index to the subdirectory structure of your hard disk.

While DOS will print out a list of subdirectories if you type

    DIR *.

the list will also include any filename that lacks an extension. The DOS manual provides a better way, using FIND.

    DIR | FIND "<DIR>"

(Actually, to save typing, all you have to type is DIR | FIND "<.").

But this will show you only the subdirectories in your root directory. For a quick on-screen list of all your subdirectories, type either

    TREE | FIND "Path"

or

    CHKDSK /V | FIND "Dir"

For a permanent copy, redirect the output into a SUBDIR.LST file

    TREE | FIND "Path" > SUBDIR.LST

or

    CHKDSK /V | FIND "Dir" > SUBDIR.LST

In fact, since CHKDSK /V reports every file on your disk in every subdirectory, along with the full path, you can use it to locate a file buried in a subdirectory many levels deep. All you need is a simple, but extremely powerful, batch file, FINDFILE.BAT, that consists of the single line

    CHKDSK / V | FIND "%1" | MORE

If you enter FINDFILE.COM, you'll see every file with a .COM extension (or with the letters COM anywhere in the filename; this would find such files as COMMAND.COM, COMMAND .BAK, MORE.COM, WELCOME .BAS, etc.). The | MORE appended at the end stops the display from scrolling if it fills the screen. In this example, you must remember not to put quotation marks around the string you're searching for, since the batch file will do this for you automatically. And be sure to enter FINDFILE search-strings in uppercase letters only.

FINDFILE.BAT isn't as fast as dedicated assembly language utilities such as the WHERE.COM we've published in User-to-User (Volume 4 Number 9), but

> ■ Hard disks can store so much data and contain so many subdirectories that it's easy to lose track of what's where.

it's slightly easier to use, for it will let you locate files by entering just a fragment of the filename. FINDFILE will uncover any matches containing the specified fragment, regardless of whether the match is to the left or right of the dot in the filename.

If you normally use FIND to uncover single words or parts of single words, and you hate typing in the required quotation marks, you can create another small batch file called F.BAT:

```
ECHO OFF
IF %2!==! GOTO OOPS
FIND "%1" %2
GOTO END
:OOPS
ECHO The format is: F STRING FILE
ECHO where STRING is the one-word
ECHO string you want, and FILE is
ECHO the file you're searching
:END
```

While this saves typing, it won't let you hunt for any strings with spaces in them, since it will interpret the word after the first space as the name of the file you want to search. Remember, too, that FIND is case sensitive, so it won't locate "String" if you tell it to find "string" or "STRING".

DOS can't handle wildcards when executing a normal FIND command, but you can get around this by using a for ...in...do subcommand, as in a batch file called FINDALL.BAT:

```
ECHO OFF
IF %1!==! GOTO OOPS
FOR %%A IN (*.*) DO FIND "%1" %%A
GOTO END
:OOPS
ECHO You must enter a one-word
ECHO string you want to find
:END
```

This batch file will uncover every matching single-word string in every file in the logged subdirectory. Unfortunately, while it will print each match it finds, it will also print the name of every file it checks, whether or not it locates a match.

It's important to note in this example that DOS requires double percentage signs (% % A) in batch file variable names, but single percentage signs (%A) when executing a for...in...do command directly. If you wanted to locate the string "Magazine" in every file in your current subdirectory, at the DOS prompt

you would enter the direct command:

```
FOR %A IN (*.*) DO FIND "Magazine" %A
```

FIND OPTIONS One of FIND's less-used features is its ability to number your lines—or just to count them. If you want to see how many lines are in a file called TEST, just execute the command

```
FIND /C " " TEST
```

This assumes, of course, that every line in the TEST file has at least one space in it. Since the /V FIND option looks for every line that does *not* contain a specified string, you could check and see if there are any lines in the TEST file that don't contain strings by using the command

```
FIND /C /V " " TEST
```

The FIND /N option will prefix each line in your file with a sequential line number. If you wanted to create a new TEST file called TEST.NEW that had each line numbered, you would simply type

```
FIND /N " " TEST > TEST.NEW
```

(While the DOS manual claims that "if /C is specified with /V or /N, then FIND ignores /V and /N", this statement is wrong. It's true that FIND won't number lines if you use the /N and /V options, but it will indeed count the number of lines *not* containing a specified string if you use both /C and /V together.)

You can use FIND to clean up many displays and reports. For instance, if you want to see how many bad sectors you have on your hard disk and you type CHKDSK, DOS will bury this bad-sector information in with a report on the volume name, the amount of free memory, the number of hidden files, etcetera. But if you filter the output through FIND

```
CHKDSK | FIND "bad"
```

all you'll see is how many bytes of bad sectors DOS uncovered. By putting other strings inside the quotes, you could use this same technique to report just the number of subdirectories, the amount of free space on your disk, the number of files on your disk, etcetera.

One of the more annoying aspects of

DOS is that it won't ordinarily report the time and date without asking you whether you want to reset them. By using FIND, however, you can create two files, T.BAT and D.BAT, that will print the current time and date without any fuss.

Both T.BAT and D.BAT require an additional file, CR, whose entire contents consist of a single carriage return. To create CR, type

```
COPY CON CR
```

then hit the Enter key twice, then the F6

> ■ One of FIND's less-used features is its ability to number your lines— or just to count them.

function key, then hit Enter a third time. (CR effectively hits the Enter key in response to DOS's request to update time and date information.)

T.BAT contains the single line

```
TIME <CR | FIND "Cu"
```

while the single line in D.BAT is

```
DATE <CR | FIND "Cu"
```

Many RAMdisk users reset their COMSPEC so that DOS looks on the correct drive if it needs to reload COMMAND .COM. What's your current COMSPEC? A single-line batch file called COMSPEC.BAT will let you know:

```
SET | FIND "SP"
```

If you've ever used the TYPE command to snoop inside a .COM file to see what text messages it contains, you've probably been annoyed by a profusion of beeps. Whenever TYPE stumbles across a CHR$(7), it tells DOS to beep the speaker. You can avoid this by examining a file like COMMAND.COM by typing

```
FIND /V " " COMMAND.COM
```

(Note: You don't actually enter the "G in the above example, although one will show up onscreen when you enter the CHR$(7). To enter this character, after typing in the FIND /V and the initial quotation mark, hold down the Alt key, and while holding it down type 007 on the number pad (do not use the numbers on the top of the keyboard) and then release the Alt key. Then type the second quotation mark and the COMMAND.COM filename.)

The above techniques assume you're hunting for single strings only. By piping the output of one FIND command through another FIND command, you can limit your search to the few instances where two specified strings occur in the same line.

Suppose you have a file called NAMEFILE with the following contents:

John Jones, 3 Main Street, Tulsa OK
Mary Smith, 1 Park Lane, Washington, DC
John Jones, 21 M Street, Washington, DC

If you wanted to locate just the Jones who lived in Washington, typing

```
FIND "Jones" NAMEFILE
```

would report both the Jones you were looking for and the one you weren't. You could limit the search to lines containing both "Jones" and "DC" with

```
FIND "Jones" NAMEFILE | FIND "DC" NAMEFILE
```

FIND also makes it easy to print a list of files that you've either created or changed on a particular day. If you've been toiling away all day on 12/9/86 and you want to check a particular file you updated early in the morning but have forgotten its name, you can simply type

```
DIR | FIND "12-89-86" | FIND "a"
```

The first FIND in the command will search for everything created on 12/9 (you must remember to pad single-digit dates with zeros), and the "a" will limit the search only to files created before noon. This assumes, of course, that you

■ PC LAB NOTES

PRODUCTIVITY

continued

properly date- and time-stamp your files.

While you can pipe the output of one FIND search through several others, such repeated FIND sieves can take an awfully long time unless you're working on a fast hard disk or RAMdisk.

CREATING AN ADDRESS BOOK

The classic use of FIND is to provide you with a lightning-fast address book. First, to build up your NAMEFILE file of names and addresses, you create an ADDNAME.BAT batch file with the following contents:

```
ECHO OFF
ECHO Enter up to one line of name
ECHO and address info at a time
ECHO --
ECHO When all done, hit Enter, then
ECHO the F6 key, then Enter again
ECHO --
ECHO Enter names and addresses now:
COPY NAMEFILE + CON NAMEFILE > NUL
```

Then, whenever you want to add a new name to your NAMEFILE list, just type ADDNAME and follow the directions on-screen. When you've finished entering new names, be sure to hit the Enter key, then the F6 function key, and then the Enter key one last time. The > NUL in ADDNAME.BAT prevents unnecessary text from showing up on-screen.

The actual LOOKUP.BAT batch file that performs your address book searches contains the single line

```
FIND "%1" NAMEFILE | MORE
```

Again, note those quotation marks in the batch file saves you from having to type them in yourself each time you want to look something up, but it also limits you to single-word entries. If you don't mind

typing quotation marks from the command line and you want the ability to search for strings with spaces in them, create the following LOOKUP.BAT:

```
FIND %1 NAMEFILE | MORE
```

If you create your master NAMEFILE properly, you can use this technique to print out the listings for those people who live in NY, or have a ZIP code that starts with 100, or have an area code beginning with 212. And if you add discrete codes to the NAMEFILE listing—such as XM to indicate that the person should be on your Christmas card list—you can sort such listings out easily.

Remember, though, that FIND is case sensitive, and that if you're hunting for Empire State listings by searching for "NY", LOOKUP.BAT would also print out a listing for the "PONY Sneaker Company." Also, while ADDNAME makes it easy to expand your master NAMEFILE list, you'll have to use your word processor to delete unwanted listings.

Alternatively, you could create a DELNAME.BAT batch file that used redirection and the /V FIND option to delete names:

```
COPY NAMEFILE NAMEFILE.BAK
FIND/V "%1" NAMEFILE.BAK|FIND/V "-" >NAMEFILE
```

This DELNAME.BAT procedure is far from foolproof, however, since it's all too easy to delete an inadvertent match (which is why the batch file creates an automatic backup file). Further, DELNAME.BAT adds blank lines to the beginning of the new file. But if you're careful and don't mind a pile of useless carriage returns at the head of the file, it does the job. **—Paul Somerson**

TYPE command in line 22 gives you an immediate readout of the final contents of TEMP.DAT.

CODING DATA FILES

In the line-oriented data files we have been using, you may have noticed that there may not be enough room on a single line for lengthy descriptive fields. Since the FIND command displays only one line containing the searched-for "string", everything must fit that limitation. To save space on the line,

however, you can replace keywords themselves with very simple one- or two-character codes. A sample of this procedure is as follows:

Code	Type	Code	District
#1	DOCTOR	#7	NORTH
#2	TEACHER	#8	SOUTH
#3	ATTORNEY	#9	EAST
#4	CPA	#10	WEST

A typical file might then look like this:

```
@1 @7 JANET JACKSON
@3 @8 JOHN SMITH
@2 @7 PAUL LILEY
```

■ **PC LAB NOTES**

SEARCH SOFTWARE

The following commercial utilities are a sample of software products that are currently available on the market and can search strings, usually both in ASCII and hex, across one or more files in a given directory.

FACT FILE

DOS File View
IBM Personally Developed Software
P.O. Box 3305
Wallingford, CT 06492
(800) 426-7279
List Price: $19.95
Requires: 128K RAM, one disk drive, DOS 2.0 or later.
In Short: Views files without invoking editor; searches for specific words or characters, reads files in 64K-byte segments with a single command, chooses different screen colors to view files when using color display. ASCII or hexadecimal display. Allows you to make one copy; is copy protected thereafter.
CIRCLE 820 ON READER SERVICE CARD

PC-Tools
Central Point Software
9700 SW Capitol Hwy., # 100
Portland, OR 97219
(503) 244-5782
List Price: $39.95 plus shipping.
Requires: 256K RAM, DOS 2.0 or later.
In Short: A file utility that includes a function to search for strings of characters across files. Not copy protected.
CIRCLE 821 ON READER SERVICE CARD

DOS2OOLS
E-X-E Software Systems
2370 Harbor Blvd., Unit A
Santa Ana, CA 92704
(714) 662-2535
List Price: $99
Requires: 128K RAM, hard disk, DOS 2.0 or later.
In Short: A collection of more than 40 DOS utility programs, including one that allows global searches of character strings. Not copy protected.
CIRCLE 823 ON READER SERVICE CARD

The Norton Utilities
Peter Norton Computing
2210 Wilshire Blvd.
Santa Monica, CA 90403
(213) 453-2361
List Price: $99.95
Requires: 128K RAM, one floppy disk drive, DOS 2.0 or later.
In Short: Two programs included in the *Norton Utilities* package accomplish string searches of ASCII and hexadecimal characters. Simultaneous searches of ASCII and hex characters are possible; also searches through files, subdirectories, erased space, or the entire disk. Not copy protected.
CIRCLE 822 ON READER SERVICE CARD

File Recovery System, Version 4.0
Brown Bag Software
2105 S. Bascom Ave., # 164
Campbell, CA 95008
(800) 523-0764
(800) 323-5335 (in Calif.)
List Price: $129.95
Requires: 128K RAM, one floppy disk drive, DOS 1.1 or later.
In Short: A file-recovery utility that can search strings of ASCII or hexadecimal characters across all files on a disk. Not copy protected.
CIRCLE 824 ON READER SERVICE CARD

Once the file is entered, you can find a variety of information using any of the single or combined FIND commands shown earlier or by using the SEARCH.BAT file to locate multiple parameters and automate the FIND filter.

Tom Sheldon is the author of a book on the rudiments of DOS entitled Introducing PC-DOS and MS-DOS, A Guide for Beginning and Advanced Users, *published by McGraw-Hill Book Co. He lives in Santa Barbara, California.*

THE POWER OF SUGGESTION

If you're interested in experimenting at the bounds of subliminal perception, here's a utility to open the way to the subconscious.

In September 1957, James Vicary claimed to have increased the concession sales of a movie theater by repeatedly displaying the subliminal messages "Drink Coke" and "Eat popcorn" on the screen. No evidence was provided to support his claim, but since then many studies have attempted to investigate the effects of subliminal messages. Whether or not subliminal messages work is still in question. Arguments can be found to support both sides.

SUGGEST.COM is a resident program that allows you to flash what I call supraliminal messages in the background while you do your work. Taken literally, *subliminal* means "below threshold" and *supraliminal* means "above threshold." When SUGGEST flashes your message on the screen, it is very fast but not completely invisible. In most cases you will be able to read the message or at least perceive the flash. This is really in one sense an advantage. It lets you play around with almost-subliminal suggestion without the possible potential for abuse involved in displaying messages completely without one's awareness. As you'll see in a moment, the maximum "on" time for your messages is controlled primarily by the design of the monitor rather than the design of SUGGEST.

TAKING A HINT Instructions for getting your own copy of SUGGEST without having to key in the .ASM listing (shown in Figure 1) or the BASIC program (listed in Figure 2) are covered in the accompanying box. Once you have SUGGEST

```
CODE SEGMENT                                    ;******************************
        ASSUME CS:CODE,DS:CODE                  ;*                            *
        ORG 100H                                ;*   REMEMBER TO EXE2BIN      *
                                                ;*                            *
START:          JMP     INITIALIZE              ;******************************
;
;                DATA AREA
;
COPY_RIGHT      DB      'Copyright 1986 Ziff-Davis Publishing Co.'
SCREEN_SEG      DW      0B000H
OLD_TIMER       DD      ?
STATUS_REG      DW      ?
;
COUNTER         DW      0
TIME_OUT        DW      1
FREQUENCY       DW      7387H                   ;Twenty seven minutes
;
FREQ_CONSTANT   EQU     3276                    ;Three minutes
DURA_CONSTANT   EQU     4285                    ;1/7.1888 sec.
;
;                CODE AREA
;
SUGGEST:        STI                             ;Turn the interrupte back on
                PUSHF                           ; and save the flags
                PUSH    AX                      ; and all registers we will
                PUSH    CX                      ; be using.
                PUSH    DX
                PUSH    DS
                PUSH    ES
                PUSH    SI
                PUSH    DI
;
                PUSH    CS                      ;Retrieve our data segment.
                POP     DS
                INC     WORD PTR COUNTER        ;Increment the counter.
                MOV     DX,COUNTER
                CMP     DX,FREQUENCY            ;Is it time to display?
                JNE     EXIT                    ;If no, exit
                MOV     WORD PTR COUNTER,0      ; else, reset counter
                MOV     DX,40H                  ;Point to ROM BIOS data area.
                MOV     DS,AX
                MOV     AL,ES:[49H]             ;Get current CRT_MODE
                CMP     AL,3                    ;Is it 40 column?
                JBE     EXIT                    ;If yes, exit
                CMP     AL,7                    ;Is it color card in test?
                JBE     DISPLAY                 ;If yes, display,
                CMP     AL,7                    ;Is it mono card?
                JNE     EXIT                    ;If no, exit.
DISPLAY:        MOV     DX,STATUS_REG           ;Retrieve status register and
                MOV     AX,SCREEN_SEG           ; retrieve screen buffer segment.
                PUSH    DS
                POP     ES
                MOV     DS,AX
                MOV     SI,16B*11               ;Source is 11th row of screen
                MOV     DI,OFFSET SCREEN        ;end destination end of code.
                CLD                             ;Set direction forward.
                CALL    READ                    ;Go read the screen.
                                                                    (continues)
```

Figure 1: *The assembler code for SUGGEST.COM.*

■ **PROGRAMMING/UTILITIES**

.COM, to use it, from the DOS prompt simply enter

   SUGGEST message[/Fn][/Dn]

Your suggestive *message* may be up to 80 characters in length; longer messages will simply be truncated. The /F and /D switches are optional. If used, *n* is replaced with a number from 1 to 9. The /F switch changes the frequency with which your message is displayed: the larger the number, the more frequently the message pops onto the screen. For each increment of the frequency number, an additional 3 minutes is subtracted from the default rate of once every 27 minutes. Actually, it's 27 min-

> ■ **SUGGEST lets you play around with almost-subliminal suggestion without the potential for abuse involved in displaying messages without one's awareness.**

utes and 5 seconds. Subtracting 3*9 min-utes from the 27 leaves the highest repetition rate, which is once every 5 seconds. /F3 displays every 3 minutes, /F7 every 6 minutes, /F6 every 9 minutes, and so on.

The /D switch changes the duration for which the message is displayed. The larger the number, the longer the message-on time. The briefest flash is obtained from the default /D0 and is approximately [17]/1000 of a second. Each higher integer adds that much more to the display-on time. The data on subliminal messages is too controversial for me to recommend a display frequency and duration; all I can suggest is to use times that you feel comfortable with. If you change the defaults, be sure the switches are added at the end of your message. For example, to cause the suggestion "Think positively" to appear once every 15 minutes or [17]/200 of a second, you would enter

```
          PUSH    DS              ;Switch source
          PUSH    ES              ; and destination segments.
          POP     DS
          POP     ES
          MOV     SI,OFFSET MSG   ;Point to message
          CALL    WRITE           ; and go write it.

DELAY:    MOV     CX,TIME_OUT     ;Get the duration time out
          DEC     CX              ; and delay here while monitor
          JNE     DELAY           ; displays message.

          MOV     SI,OFFSET SCREEN ;Point to date and replace
          CALL    WRITE            ; it on the screen.

EXIT:     POP     DI              ;Restore registers
          POP     SI              ; and flags.
          POP     DS
          POP     ES
          POP     DX
          POP     CX
          POP     AX
          POPF

          JMP     CS:OLD_TIMER    ;Goto old timer interrupt.

;------------------------------------------------------;
; This subroutine will read three lines in the middle  ;
; of the screen and store them at the end of code so the ;
; display can be restored after we display our message. ;
;------------------------------------------------------;

READ:     MOV     CX,3*80         ;Point to three lines.
HORZ_RET1: IN     AL,DX           ;Get status.
          TEST    AL,1            ;Is it low?
          JNE     HORZ_RET1       ;If no, wait until it is.
          CLI                     ;No more interrupts.

WAIT1:    IN      AL,DX           ;Get status
          TEST    AL,1            ;Is it high?
          JZ      WAIT1           ;If no, wait until it is.
          LODSB                   ;Retrieve a byte.
          STI                     ;Interrupts back on.
          STOSB                   ;Store the byte.
          INC     SI              ;Bump the point past attribute.
          LOOP    HORZ_RET1       ;Get next byte.
          RET                     ;Return.

;------------------------------------------------------;
; This subroutine writes three lines to the screen buffer. ;
;------------------------------------------------------;

WRITE:    MOV     DI,160*11       ;Point to the 11th row.
          MOV     CX,3*80         ;Count of three rows.
PUT_BYTE: MOV     AL,[SI]         ;Get a byte.
HORZ_RET2: IN     AL,DX           ;Store it in AH.
          TEST    AL,1            ;Is it low?
          JNE     HORZ_RET2       ;If no, wait until it is.
          CLI                     ;No more interrupts.

WAIT2:    IN      AL,DX           ;Get status.
          TEST    AL,1            ;Is it high?
          JZ      WAIT2           ;If no, wait until it is.
          MOV     AL,AH           ;Retrieve the byte
          STOSB                   ; and store it.
          STI                     ;Interrupts back on.
          INC     DI              ;Bump pointer past attribute.
          LOOP    PUT_BYTE        ;Write next byte.
          RET                     ;Return.

;------------------------------------------------------;
; This is the start of the install. We will need the port of status ;
; register and the video card address. Then we will parse the command ;
; line and store. Check for frequency and duration switches. Take the ;
; the timer tick interrupt and terminate but stay resident. ;
;------------------------------------------------------;

INITIALIZE: MOV   AL,32           ;First get the message
          MOV     DI,OFFSET MSG   ;storage area with three
          MOV     CX,80*3         ;lines of spaces.
          REP     STOSB

PARSE:    XOR     AX,AX           ;Zero in string counter.
          MOV     SI,82H          ;Point to string.
          CMP     BYTE PTR[SI-2],I ;Is there a string?
          JA      GET_MSG         ;If yes, get the message length
          INT     20H             ; else terminate.

                                    (Figure 1 continues)
```

```
GET_MSG:    LODSB                       ;Get a byte.
            INC     CX                  ;Increment counter.
            CMP     AL,13               ;Is it carriage return?
            JE      MESSAGE             ;If yes, end of message.
            CMP     AL,'/'              ;Is it switch character?
            JNE     GET_MSG             ;If no, get next byte.

GET_SWITCH: LODSB                       ;Get a byte.
            CMP     AL,13               ;Is it carriage return?
            JE      MESSAGE             ;If yes, end of switches.
            AND     AL,5FH              ;Capitalize.
            CMP     AL,'F'              ;Is it frequency switch?
            JNE     DURATION            ;If no, check duration switch
            CALL    CONVERT             ;else convert number to hex
            MOV     BX,FREQ_CONSTANT    ;get frequency constant
            MUL     BX                  ;end multiply.
            SUB     FREQUENCY,AX        ;Subtract from frequency default.
            JMP     SHORT GET_SWITCH    ;Get next character.

DURATION:   CMP     AL,'D'              ;Is it duration switch?
            JNE     GET_SWITCH          ;If no, get next character
            CALL    CONVERT             ;else convert number to hex
            MOV     BX,DURA_CONSTANT    ;get duration constant
            MUL     BX                  ;end multiply.
            ADD     TIME_OUT,AX         ;Add to time out default.
            JMP     SHORT GET_SWITCH    ;Get next character.

MESSAGE:    MOV     SI,82H              ;Point to message.
            MOV     DI,OFFSET MSG+88    ;Point to storage.
            DEC     CX                  ;Adjust counter.
            CMP     CX,80               ;Is it more than one line?
            JB      CENTER              ;If no, center
            MOV     CX,80               ;else, truncate to one line
            JMP     SHORT STORE         ;end store.

CENTER:     MOV     BX,80               ;Take 80
            SUB     BX,CX               ;and subtract message length
            SHR     BX,1                ;divide by two
            ADD     DI,BX               ;end add to storage offset.

STORE:      REP     MOVSB               ;store.

CARD:       MOV     AX,40H              ;Point to ROM BIOS data area.
            MOV     ES,AX
            MOV     AX,ES:[63H]         ;Get base address of video card.
            ADD     AX,6                ;Convert to status register
            MOV     STATUS_REG,AX       ;end store.
            CMP     AX,3BAH             ;Is it mono card?
            JE      INTERRUPT           ;If yes, go to interrupt
            ADD     WORD PTR SCREEN_SEG,800H ;else point to color card.

INTERRUPT:  MOV     AX,351CH            ;Get timer tick vector.
            INT     21H
            MOV     WORD PTR OLD_TIMER,BX ;end store offset
            MOV     WORD PTR OLD_TIMER[2],ES ;end segment.

            MOV     DX,OFFSET SUGGEST   ;Replace with our
            MOV     AX,251CH            ;offset and segment.
            INT     21H

            MOV     DX,OFFSET SCREEN+88*3+1 ;Terminate but
            INT     27H                 ;stay resident.

; This subroutine will convert decimal to hex ;

CONVERT:    XOR     AH,AH               ;Zero in high half.
            LODSB                       ;Get a byte.
            CMP     AL,'1'              ;Is it less than one
            JB      IGNORE              ; or more than nine?
            CMP     AL,'9'
            JA      IGNORE              ;If yes, ignore
            SUB     AL,30H              ;else convert to decimal
            RET                         ;end return.

IGNORE:     MOV     AL,0                ;Default is zero.
            RET                         ;Return.

; Message and screen storage is placed here instead of in ;
; the data area to move 400 bytes in the BASIC data listing.;

MSG:
    ORG     OFFSET MSG+88*3
SCREEN:

CODE ENDS
END     START
```

(Figure 1 ends)

SUGGEST Think positively/F4/D4

Your message will be displayed only in 80-column text mode. SUGGEST was meant to be installed only once, though no harm will be done if you choose to install more than one message. No provision has been made to disable or uninstall, so you must reboot to either change or remove SUGGEST.

HOW SUGGEST WORKS The first time that SUGGEST is run it gets and stores the vector of the current timer tick routine and replaces it with the segment and offset of SUGGEST. Thereafter,

■ Studies have shown that to make a message truly subliminal, its display duration should be close to $1/1000$ of a second. Experimenters use a tachistoscope.

SUGGEST is serviced with every tick of the clock—18.2 times a second. Upon subsequent entry, SUGGEST increments a counter. When the count equals the time-out—27 minutes by default or one of the nine time-outs set by the frequency switch—SUGGEST resets the counter to zero and prepares to display the message.

First, the current middle three rows of the display are retrieved and stored. Next, your message is displayed in the middle row, with the upper and lower message-framing rows filled with spaces. If a delay was added with the duration switch, SUGGEST pauses before restoring the screen. Control is then passed back to the old timer tick routine.

Studies have shown that in order to make a message truly subliminal, its display duration should be close to $1/1000$ of a second. To study the effects of subliminal messages, experimenters use a tachisto-

■ PROGRAMMING/UTILITIES

DOWNLOADING SUGGEST

The programs that appear in our Programming/Utilities column (as well as other programs we publish) can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. Making copies for others (including placement on other electronic bulletin boards), with or without charge, is a violation of the Ziff-Davis copyright.

The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1200 (or 300) bps, 8 data bits, 1 stop bit, no parity. PC-IRS files with a .COM, .EXE, or

.ARC extension require that you also use the Xmodem error-checking protocol; our other files (e.g., with extensions of .ASM or .BAS) can be downloaded using either ASCII or Xmodem.

SUGGEST.BAS, whether typed in from the magazine at your keyboard or downloaded from PC-IRS, will automatically create SUGGEST.COM when run once in BASIC. SUGGEST.ASM, also listed both here and on PC-IRS, allows you to modify the program but requires that you use a macro assembler (IBM or Microsoft) and the following commands:

```
MASM SUGGEST;
LINK SUGGEST;
EXE2BIN SUGGEST SUGGEST.COM
```

SUGGEST AT A GLANCE

Syntax:

SUGGEST message[/Fn][/Dn]

Operation: Message may be up to 80 characters in length, displayed in text mode. Default repetition frequency is once every 27.05 minutes with duration of 0.017 seconds. The /Fn (frequency) and /Dn (duration) switches are optional and can range from 1 to 9, producing repetition rates as frequent as every five seconds and durations as long as 0.17 seconds. SUGGEST is memory-resident; you must reboot to change the message.—Craig L. Stark

■ PROGRAMMING/UTILITIES

scope—a box capable of displaying images at this high speed. PC monitors, on the other hand, are refreshed from top to bottom every .017 seconds—that is, 60 times a second. This is where I obtained the $^{1}/_{1000}$ duration constant, which becomes the limiting factor for flashing the message on your monitor and replacing it with the original screen data. It takes approximately $^{3}/_{60}$ of a second to display three rows on the screen. If the three middle rows are scanned immediately after they are put in the screen buffer and are then replaced with the original data, an $^{1}/_{60}$ of a second will have elapsed. However, another $^{2}/_{60}$ of a second must elapse before the original data is scanned.

Indeed, you can actually observe the raster scan. If you choose the /F9 switch (5-second frequency), you will notice that occasionally the message seems to be skipped. This is because the timing of the scan and the moving of the message into the screen buffer are such that the message never gets scanned before it is replaced with the original screen data. Even more interesting is what happens when the line that we are placing on the screen is the same line that the monitor is scanning. Then as we place each character in the buffer, the electron gun moves down another scan line and only a part of our message appears. And it appears as a wedge. This happens only with the duration default of no additional raster scans.

In addition to the raster scan time, the

```
100 REM -- BASIC PROGRAM TO CREATE suggest.COM
110 OPEN "SUGGEST.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A$
130 CHECKSUM = 0
140 FOR I% = 1 TO 40
150    LINESUM = 0
160    FOR J% = 1 TO 8
170       READ BYTE%
180       CHECKSUM = CHECKSUM + BYTE%
190       LINESUM = LINESUM + BYTE%
200       IF (BYTE% < 256) THEN LSET A$ = CHR$(BYTE%)
210       PUT #1
220    NEXT J%
230    READ LINECHECK%
240    IF LINECHECK% <> LINESUM THEN PRINT "Error in Line";320 + 10 * I%
250 NEXT I%
260 FOR I% = 1 TO 236
270    LSET A$ = CHR$(0)
280    PUT #1
290 NEXT
300 CLOSE
310 IF CHECKSUM = 304541 THEN PRINT "Successful Completion!" : END
320 PRINT "COM file is not valid!" : END
330 DATA  323,   212,    0,   67,  111,  112,  121,  114,   970
340 DATA  185,  103,  104,  116,   52,   49,   56,   52,   622
350 DATA   54,   32,   80,  185,  182,  182,   45,   68,   598
360 DATA   97,  116,  185,  115,   52,   80,  117,   85,   762
370 DATA  185,  185,  115,  104,  185,  115,  118,  183,   32,   762
380 DATA   67,  111,   46,    9,  176,    6,    0,    8,   480
390 DATA  135,    0,    9,    0,    9,    0,    8,  135,   136
410 DATA  115,  251,  156,   80,   81,   82,   38,    6,   681
420 DATA  86,   87,   14,   51,  255,    6,   51,    1,   131
430 DATA  139,   22,   51,    1,   59,   22,   55,    1,   350
440 DATA  117,   72,  199,    6,   51,    1,    0,    0,   445
450 DATA  184,   64,    0,  142,  192,   38,  168,   73,   853
460 DATA    8,   68,    1,  116,   13,   52,  191,  189,  618
470 DATA    4,   68,    7,  117,   44,  139,   22,   46,   442
480 DATA  100,  224,    6,  101,  116,    3,  252,  232,  1214
490 DATA   36,   82,    6,   38,    6,   31,    7,  198,  132,   432
510 DATA    2,  232,   47,    6,  138,   14,   53,    1,   480
520 DATA   73,  117,  253,  180,  116,    3,  232,   34,  1010
530 DATA    6,   55,   94,   71,   53,  185,  240,   975
540 DATA    8,  236,  168,    1,  117,  251,  250,  236,  1259
550 DATA  168,    1,  116,  251,  272,  251,  170,   70,  1109
560 DATA  225,  238,  185,  181,  224,    6,  185,  240,  1506
570 DATA    8,  175,  184,  224,  236,   81,    1,  117,  1096
580 DATA  251,  250,  236,  168,    1,  116,  251,  198,  1411
590 DATA  196,  198,  251,   71,  226,  235,  185,  176,  1528
610 DATA   32,  181,  192,    9,  185,  240,    6,  243,  1825
610 DATA  139,  178,   54,  230,  228,  138,    0,  128,  124,   994
620 DATA  251,    1,  116,    2,  205,   32,  172,   65,   850
630 DATA   68,   13,  116,   47,   68,   47,  117,  246,   706
640 DATA  173,   68,   15,  116,   56,   65,    0,   68,   580
650 DATA   70,  117,   14,  232,  180,    6,  167,  204,   933
660 DATA  122,  247,  227,   41,    6,   51,    1,  235,   824
670 DATA  231,   68,   68,  117,  227,  222,   81,    0,  1026
680 DATA  107,  109,   16,  247,  227,    1,    6,   53,   648
690 DATA    1,  235,  213,  190,  138,    0,  101,  112,  1172
700 DATA    3,   73,  131,  244,   80,  114,    5,  185,   530
710 DATA   84,  80,    8,  235,    9,  107,   68,    0,   43,   634
720 DATA  217,  209,  235,    5,  251,  243,  144,  184,  1586
730 DATA   45,   2,    8,  142,  192,   38,  161,   80,    0,   686
740 DATA   71,   6,  163,   46,    1,  172,  186,   640
750 DATA    3,  116,    6,  120,    0,   43,   40,    0,   384
760 DATA    6,  184,   28,   53,  285,   33,  137,   30,   678
770 DATA   45,    1,  148,    6,  243,    1,  106,   57,   483
780 DATA    1,  184,   28,   37,  285,   33,  146,  141,   755
790 DATA  134,    4,  285,   36,   58,  228,  172,   68,   40,   497
810 DATA  134,    7,   68,   57,  119,    3,   44,   45,   452
810 DATA  193,  196,   65,   68,   56,    0,   78,    0,   566
```

Figure 2: A BASIC program that will automatically create SUGGEST.COM.

■ **SUGGEST displays very short supraliminal messages rather than subliminal messages.**

---

message is being displayed over spaces when the spaces are restored to the screen, "nothing" is written over the message and a latent image can be observed. This latent image is produced by the phosphorous recovery time. This glow effect is the reason the monitor does not flicker. For our purposes, however, it simply adds one more limitation on our ability to control the display time. The increase will differ with monitors, the older models having longer recovery times.

The net effect is that SUGGEST displays very short supraliminal messages rather than subliminal messages. Experiment with them and see how they work for you. I tried

```
SUGGEST Write a super article on subliminal
messages.
```

So far, I don't know if it was effective.

Michael J. Mefford is a microcomputer consultant who works out of his home in Gleneden Beach, Oregon.

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■ **JARED TAYLOR**

SPREADSHEET CLINIC

Adding missing financial functions to 1-2-3, a bug that could destroy a database, a cell-concatenating macro, and faster Super Calc graph printing.

INTEREST RATES

1-2-3, Release 1A, has a number of @ functions for financial calculations, but none for calculating future value, present value, and compound interest rate. For example, if you invest $100 at 12 percent compounded interest, how much will you have after 5 years? *1-2-3* has no @ function for this, but you can calculate it with the first formula in Figure 1. If you have a future value and want to work backward to find a present value, you can use the second formula. Finally, if you know the future value, present value, and number of compounding periods, you can use either the third or the fourth formula to calculate the rate. The third formula solves for i in the preceding equations, while the fourth formula uses natural logarithms to arrive at the same figure.

Solving for interest rate is a little unusual, but it's a good way to evaluate stock performance. If you bought a stock in the past, you know its purchase price, current selling price, and how long you have held it. By solving for the rate, you will get a percentage figure for capital appreciation or loss.

Ron Pokornowski
Winfield, Illinois

Release 1A of 1-2-3 has @ functions for the present and future values of an annuity but rather oddly left out functions for present and future values of a single sum. Release 2.0 still can't calculate PV or FV, but it added a financial function of dubious value: it calculates the number of compounding periods required for a given pre-

sent value to become a given future value at a given rate of interest. Although I don't think I'll use it very often, it's a function that solves for N in the equations shown in Figure 1.

ROW INSERTION BUG

Here is a bug in *1-2-3*, Release 2.0, that I haven't seen documented anywhere. It's potentially serious, for it can destroy a database.

To see the bug in action, take any spreadsheet with rows of data in it. Then give one column a special format (currency, percent, etc.) and extend that format all the way to the bottom of the spreadsheet. This is something you might do if you were expecting to add data to a model. Now, try to insert a new row anywhere in the spreadsheet. You'll get an error message, "Worksheet Full," because *1-2-3* can't push a format past row 8192. However, when you hit Escape to clear the error message, the new row will actually materialize, but only to the right of the formatted column.

If that column were at the right edge of the screen, or off to the right out of sight, you might never notice the partial new row that appeared in the spreadsheet. If this happens in the middle of a database, all the records below the insertion will be wrong

```
Formula for future value (FV):

         FV = PV*(1+i)^N

Formula for present value (PV):

         PV = FV/(1+i)^N

Formula for interest rate (i):

         i = (FV/PV)^(1/N)

Formula for interest rate, using log base e:

         @exp(@ln(FV/PV)/N)-1

FV = future value
PV = present value
i  = interest rate
N  = number of compounding periods
```

Figure 1: *Formulas that calculate missing 1-2-3 financial functions.*

■ SPREADSHEET CLINIC

and you might never figure out how they got that way. You'll be in even more trouble if you sort the database before you discover the mistake. You'll develop an immediate appreciation for backup copies.

Spencer B. Roane III
Atlanta, Georgia

Ouch! This bug could bite you where you least expect it. Fortunately, Release 1A

■ If you concatenate labels that are flush-right or centered you'll get strange results.

doesn't have this problem. Also, neither release will do mischief to your data if you try to add a column after formatting a row all the way to the end of the spreadsheet. All you get then is an error message.

The Release 2.0 manual specifically warns you that if you try to insert a row after formatting a column all the way to the bottom, you'll get an error message. It then tells you to reset the format of any blank cells in the column, then save and retrieve the worksheet. This will not eliminate the partial new row, however, nor does the manual warn you about it.

CONCATENATING CELL CONTENTS
In Spreadsheet Clinic of April 29, 1986 (Volume 5 Number 8), you printed a submission that concatenates *1-2-3* cell contents. It works, but Figure 2 contains two macros that are much simpler. The first, \D, is for concatenating labels, and the second, \E, is for concatenating numbers. The difference is that you have to add a leading apostrophe (') when you want to concatenate numbers.

To use either macro, put the cursor on the first cell whose contents you want to concatenate and run the macro. When the macro pauses, put the cursor on the cell you want to combine with it and hit Enter. The contents of both will then appear in the second cell. The macros work by copying the contents of the cells into the blank cells

```
\D        /c~first~/c{bs}{?}~second~`

FIRST

SECOND
```

Figure 2: *Two macros that concatenate cell contents.*

```
\E        {edit}{home}'"/c~ONE~
          {?}{edit}{home}'"/c~TWO~`

ONE

TWO
```

```
\Q        {recalc TEST}
          {if @exact(TEST,'")}{branch COPY1}
          {edit}{home}'~

COPY1     /c~UNO~{?}
          {recalc TEST}
          {if @exact(TEST,'")}{branch COPY2}
          {edit}{home}'~

COPY2     /c~DOS~`
UNO

DOS

TEST      <==== This cell contains the
                formula:
                @CELLPOINTER("prefix")
```

Figure 3: *A macro for Release 2.0 that can tell if cell contents to be concatenated are labels or numbers.*

in the macros (FIRST and SECOND, ONE and TWO) and then reading them into a single cell.

The rows between FIRST and SECOND, and ONE and TWO appear to be blank, but in fact they are not. Each contains a space, which will separate the contents of the two source cells once they are concatenated. If there really is nothing in that cell, the macros won't work. If you don't want a space between the contents of the source cells, remove the row.

These two macros will work with both Releases 1A and 2.0. With Release 2.0, you could use @isnumber to test whether a cell was a number or a label, and use the same macro for labels and numbers.

Roger Flores
Redwood City, California

These are good, straightforward macros. I have written a slightly more elaborate one, shown in Figure 3, which will run in Release 2.0 and can tell the difference between numbers and labels. Instead of using @isnumber, I used @exact. This function compares the contents of the cell TEST with the string in parentheses, which is an apostrophe ('). TEST uses the @cellpointer function to display the prefix of whatever cell the cursor is on. Thus, as you move it around the screen picking out things to concatenate, it can tell whether a cell's contents begin with an apostrophe—that is, whether it is a number or a label. If it's a label, there's no need to insert a leading apostrophe, so the macro branches directly to the copying step. (However, if you try to concatenate labels

■ SPREADSHEET CLINIC

that are flush-right or centered, you'll get strange results.)

This macro contains a lot of instructions, but they are not the kind that slow a macro down. It will run almost as quickly as the two in Figure 2.

TEST has to be recalculated before every test of whether a cell contains a number or a label, because the @cellpointer function must be constantly updated. In Figure 3 it appears to be blank, because the last time it was updated, the cursor was on a label. If it had been on a number instead, TEST would have displayed an apostrophe.

As in the macros in Figure 2, you must give the cells in the macro the range names in the column to the left.

SPEEDING UP SUPERCALC

I use SuperCalc for statistical analysis and often print the results as graphs. But, when I print on the Epson RX-80, the printer

> ■ A RAMdisk is an option that copy protection does away with, so spreadsheet users who are stuck with Lotus products can only dream.

stops every four lines while the program gets data from the disk. I'm sure the program would run quicker on a hard disk, but I don't have one.

I solved the problem another way by loading SuperCalc onto a RAMdisk. This way, "disk" access is very fast, and I've

cut the time it takes to print a graph from 15 minutes down to 5.

Douglas E. Welch
Bedford, Ohio

I'm sure that a lot of SuperCalc operations run more quickly if you run the program from a RAMdisk. That's an option that copy protection does away with, so spreadsheet users who are stuck with Lotus products can only dream . . .

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My marketing class meets when I want it to!

The Electronic University Network

POWER USER

dBASE tips for trimming leading blanks and adding context-sensitive messages; using ProKey with DEBUG and SUBST with XTREE; and increasing modem time out.

EYES LEFT

dBASE's TRIM() function is perfect for removing trailing blanks, but neither dBASE II nor Version 1 of dBASE III offers the reverse: an easy way to trim leading blanks. LTRIM.PRG, shown in Figure 1, performs this function, assuming you're working with a character field.

Daniel L. Lentz
South Milwaukee, Wisconsin

dBASE III Plus solves this sometimes-annoying problem by adding a direct function, LTRIM(): REPL <fieldname> WITH LTRIM(<fieldname>). Like Mr. Lentz's program, the new LTRIM() applies only to character-type fields.

If you have an older version of dBASE, however, the program shown in Figure 1 will come in handy if, for example, you want to clean up a name field that has leading blanks, or if you need to index a file on the ZIP code and you know that some ZIPs have not been entered flush-left.

The general technique—indexing right from the leftmost character—can be useful in different ways. Suppose you want to express a number flush-left, and it's inconvenient or impossible to use dBASE III's PICTURE '@B' function. You could modify the structure of the numeric field, converting it to character format. At this point, all the numeric data in your new character field is flush-right. The LTRIM.PRG will eat the leading blanks, pulling the character string over to the leftmost position.

With a few changes you can even

LTRIM on the fly, without modifying the data structure from numeric to character and without replacing the contents. If your fieldname for a numeric field 8 digits wide is called 'Numbr', the following routine will create a left-justified (und TRIMed) character string, no matter what value is in the Numbr field:

```
fld=STR(Numbr,8)
ref=1
DO WHILE fld=' ' .AND. ref<8
  fld=SUBS(fld,2)
  ref=ref+1
ENDDO
fld=TRIM(fld)
```

If you're LTRIMing a character field on the fly, only the first and third lines differ:

```
fld=chrfield
ref=1
DO WHILE fld=' ' .AND. ref<LEN(chrfield)
  fld=SUBS(fld,2)
  ref=ref+1
ENDDO
```

```
CLEAR
SET TALK OFF
ACCE "LTRIM which FILE? " TO fil
ACCE "REPL which FIELD? " TO fld
USE &fil
DO WHIL .NOT. EOF()
  ref=1
  DO WHILE ref<LEN(&fld)
    'ref2=SUBS(&fld,ref,1)
    IF ref2#' '
      EXIT
    ELSE
      ref=ref+1
    ENDIF
  ENDDO
  REPL &fld with SUBS(&fld,ref)
  ? &fld
  SKIP
ENDDO
SET TALK ON
```

Figure 1: *LTRIM.PRG trims leading blanks from a character field in dBASE versions prior to dBASE III Plus.*

If you're using dBASE II, remember that the syntax to STORe memory variables is different. The last line above would read

STOR TRIM(fld) TO fld

—Brad Stark

TIME OUT

My Ventel 2400 Plus modem works very well, except for the fact that it inconveniently hangs up after 30 seconds even if the S7 register is set to a higher value. (The Ventel 2400 Plus is Hayes compatible. The S7 register sets the amount of time to wait for the data carrier.) Ventel says the 30-second limit is imposed by the Rockwell chip set, which is used in many 2,400-bps modems. That's not much help: when calling long distance, I have found that 30 seconds is often not enough time for the other computer to answer the phone before the modem gives up.

One way around the problem is to add commas at the end of the phone number being dialed. Each comma adds 2 seconds before the modem begins its 30-second countdown. With an 11-digit long distance number, you can add up to 29 commas before reaching the 40-character limit. If the carrier is detected before the commas are used up, the modem responds normally and the connection is made. This feature can also be used when calling a modem that, for security purposes, has been set to wait for a high number of rings before answering.

Keith Bergman
West Valley City, Utah

■ POWER USER

I tested this on a Hayes Smartmodem 2400, which also uses the Rockwell chip set. Sure enough, the Hayes manual lists a range of 1 to 30 seconds for the S7 register—as opposed to a range of 1 to 255 seconds for my Smartmodem 1200. However, when I actually timed the modem, I found that the actual waiting time does not match the S7 setting. For settings of 0 through 3, the wait time hovers at about 8 seconds. Above that, the actual wait time is roughly twice the setting, giving a maximum of about 55 seconds with a setting of 30. If you try a higher setting, the wait time actually falls slightly (to just under 54 seconds).

If 55 seconds isn't enough, adding commas will add extra time. But on the Smartmodem 2400, at least, the dialing modem will not respond to an answer tone until it has waited out the comma-induced pauses. Thus, if you add too many commas, the answering modem may hang up the phone before your modem is ready to talk. If you do use commas to extend the wait time, also keep in mind that the S8 register defines the pause time for each comma, with a maximum of 255 seconds. Reset S8, and you can use just one comma in the dial command.—M. David Stone

PRUNING THE XTREE

I agree with Vincent Puglia ("Extending DOS's Utility," *PC Magazine*, Volume 5 Number 9) both that *XTREE* is the hard disk organizer of choice and that its chief shortcoming is the mandatory reset of the entire directory structure. This problem can be overcome by using the DOS 3.1 SUBST command, however. SUBST lets you substitute a drive letter for a path specification, and the drive letter is acceptable to *XTREE*.

I normally invoke *XTREE* in a batch file called XTRE.BAT:

```
ECHO OFF
IF %1 == " " GOTO FULL
    SUBST D: /D >NUL
    SUBST D: = %1
    XTREE D:
    GOTO END
: FULL
    XTREE
: END
```

The first SUBST turns off any previous

SUBSTitutes. The second assigns the drive letter D to a pathname I specify when invoking the batch file. For example, to examine the subdirectory \DOS\UTIL, I would enter

XTRE \DOS\UTIL

Or, to work with my current default directory,

XTRE

In either case, once in *XTREE* I can change back to a full directory display by logging on to the actual drive.

Notice that the file begins checking to see if I included a pathname. If not, it jumps to FULL, and XTREE wakes up reading the entire directory structure.
—Longden C. Loo
Ventura, California

This is one of the more inventive applications I've seen for SUBST. Be forewarned,

■ The DOS 3.1 SUBST command lets you substitute a drive letter for a path specification; this is acceptable to *XTREE*.

however, that although you may use any drive letter (A through Z) as the substitute "drive," DOS normally assumes that the last drive is E:. If A: through E: are already taken up by real drives plus a RAM-disk, you'll have to add a new line to your CONFIG.SYS file. The line reads

LASTDRIVE = *x*

where x is any letter, A through Z. The value of x becomes the highest drive letter that DOS will recognize.—M. David Stone

DEBUGGING WITH PROKEY

DEBUG.COM does not allow you to scroll back and look at some code that was displayed on the screen a few seconds (or

PRODUCTIVITY

■ The use of the macro as documentation has even wider applicability than the redirection technique.

10 minutes) earlier. You could use Ctrl-PrtSc to echo everything to the printer, but that is tediously slow. What you want is to capture an entire DEBUG session to a disk file. That way one can later scroll through and study the output or print selected portions to study or show to others.

DOS I/O redirection can capture to disk, of course, but working inside DEBUG with a blank screen (while redirection is occurring) is impractical. However, when redirection is teamed up with *Pro-Key*, it's a different story.

The trick is to run DEBUG twice. The first session—while *ProKey* records keystrokes—looks like this:

```
A>DEBUG XYZ.COM <Ret>
<alt><F1>
DEBUG SESSION HERE
<alt><F1>
```

The <alt><F1> keystroke keeps recording the macro as F1. The <alt> stops recording the macro after exiting from DEBUG.

The second DEBUG session is

```
A>DEBUG XYZ.COM > DUMP.FIL <Ret>
<F1>
```

The first line here routes the output to DUMP.FIL. The second starts the macro playback. All video output is redirected to disk, with the *ProKey* macro providing the needed keystrokes.

If you prefer, separate macros can be used for selected parts of a session. Finally, this technique is not limited to DEBUG. It can be used to capture the screen activity of any program that uses standard DOS video calls.

Ralph Keuler
Seattle, Washington

This trick comes under the category of obvious—after someone has pointed it out to you. Keep in mind also that the macro itself documents your work. If you run into a discrepancy when typing a complicated patch from Power User (or elsewhere), you can compare the macro to the printed instructions to see where you went wrong. And if you're creating a patch, you can use the macro for giving keystroke-by-keystroke instructions to others (in a Power User tip, for example). This use of the macro as documentation has even wider applicability than the redirection technique. It will work with any program that ProKey works with, not just those programs that use standard DOS video calls.—M. David Stone

MACROMANIA

I can easily create more *WordPerfect* macros than I can remember names. So to keep track of them I made a file, called MAC.WP, which is stored on the program disk, A:. The program lists my macros in alphabetical order in three columns: macro name, function, and "formula" for the macro. Then I created the macro Alt-Z, which calls up the macros for me to look at. To create the macro Alt-Z, type

```
Ctrl-F10 Alt-Z <CR>
F5 a:mac.wp <CR>
<Down Arrow>
6
Ctrl-F10
```

The first and last lines begin and end the macro definition. The second line tells *WordPerfect* to list the directory of files named MAC.WP on drive A: (highlight the drive and directory that contain your own MAC.WP). The Down Arrow moves the cursor to the filename, and the 6 tells the program to display the file.

With the macro written, you only have to invoke it in order to see the complete list of macros on your screen.

Deena Weinstein
Chicago, Illinois

This isn't as quite as useful as the macro reference screen built into ProKey, but it's a tolerable substitute. I'd use the "retrieve" function (1) rather than the "look" function (6) to call up MAC.WP. This lets you scroll forward and backward instead

of forward only. You could then place a marker—"(a (a (a "" for example—at the beginning and end of MAC.WP and define a second macro, Alt-k, for "Kill help."
Alt-K should read

```
<Home> <Home> <Up>Arrow>
F2 (a(a(a F2
<Backspace> <Backspace> <Backspace> Alt-F4
F2 (a(a(a F2
Ctrl-F4 1
```

The first line takes WordPerfect to the top of the file. The second calls up the search function and tells WordPerfect to find the first marker. The third line backspaces three spaces to erase the marker, then turns on the block definition. The fourth line finds the second marker to define the end of the block. The last line tells WordPerfect to delete the block.

Alt-H retrieves MAC.WP for reference, while Alt-K deletes the reference screen from your working file. Or call up the reference screen as document 2 and use Shift-F3 to switch to it.—M. David Stone

■ Using the "retrieve" function lets you scroll forward and backward.

HIGH-POWER PAUSE

The procedure shown in Figure 2 gives you an easy way to display messages from within a dBASE application. For example, if a menu offers choices of 1–9 and the user enters "k", the program would trap this impossible response as follows:

```
DO WHILE .T.
  * insert your menu screen here
  * GET user's choice and READ
  IF .NOT. response $ "123456789"
    DO pause WITH [No choice "]+response+["]
  ELSE
    EXIT
  ENDIF
ENDIF error-trap
ENDDO menu
```

If the user's response is not allowable, the DO WHILE loop stays active, reprinting the menu screen and reGETting the user's response. Thus, if the user gets past your error trap, you know it's safe to process his response!

Debbie Cucci
Newtonville, Massachusetts

Although the PAUSE.PRG of Figure 2 was designed for noncritical error messages, if you pause long enough to think it through, you'll probably find a lot of other uses for this handy dBASE III procedure. As examples, you might DO pause WITH any of the following:

"Don't forget to backup this new data."

"Remember to invoice this extra item."

"Bob wants THREE copies of this report."

"REM each record MUST have a zip

before indexing.

"*Please verify coding on West Coast items.*"

"*Verify: this check amount is over $1,000.*"

PAUSE.PRG thus has a lot of horse-power under the hood for such a short procedure—some of these might be useful in other programs you write.

For example, by passing the message as a parameter, you can send the user a context-sensitive message. It surrounds your message with arrows and a space. It centers the message: the expression, (80-LEN(mess))/2, asks the computer to pace off half the distance from column 39 depending on the LENgth of the current message. (Note: maximum message length is 76 characters.) This same line also enhances the message: unless you have SET INTENSITY OFF, the GET appears in reverse video. Of course, you're not actually

```
*** PAUSE.PRG
PARA mess
? CHR(7)
SET CONS OFF
mess=CHR(26)+" "+mess+" "+CHR(27)
@ 24,0
@ 24,(80-LEN(mess))/2 GET mess
CLEA GETS
x=0
DO WHIL x<25
x=x+1
ENDD x=message duration
@ 24,0
SET CONS ON
```

Figure 2: A dBASE III procedure for displaying temporary messages.

GETting anything, so the CLEAR GETS straightens that out.

PAUSE displays on the same screen line every time, so the user becomes accustomed to receiving minor error messages there. (You could choose a different line just by changing the (@24,s). It beeps to alert the user that an unusual condition exists.

Finally, having delivered its message, PAUSE gets out of the way without requiring a keystroke. It tidies up by erasing its message and RETURns to the calling program. You might even ask the user at the beginning of a session "*How long do you want reminders displayed?*" and STORE that number to a variable called "*duration.*" Then change the DO WHILE x<25 loop to DO WHILE x<duration.

—Brad Stark

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■ PAUL SOMERSON

USER-TO-USER

Printing nonprintable text characters from the command line, speeding up slow ECHO displays, and removing case sensitivity from DOS's IF batch-processing command.

SAY WHAT?

ECHO is a powerful command, but it stumbles over nonprintable ASCII characters and has other drawbacks. SAY.COM, created by the SAY.BAS program in Figure 1, is far more flexible.

SAY will print any text characters from the command line that you enclose inside double quotation marks ("). If you want to echo the quotation mark character itself, use a pair of quotes. If the quotation mark is the first character to be echoed, triple the quote marks.

SAY will handle nonprintable characters if you type in their decimal ASCII code value on the command line without embedding them between quotes (a carriage return/line feed would be 10). If you want to print the redirection or piping characters (<, >, and |), you'll have to use their ASCII values (60, 62, and 124), since DOS will try to redirect or pipe your command when it sees the actual symbols on a command line.

For example:

```
SAY ***Compaq?** he asks.* 13 10
*She answers **PC AT.*
```

will yield

```
"Compaq?" he asks.
She answers "PC AT."
```

Similarly,

```
SAY 27 "&16D" >PRN
```

sends an Escape sequence code to your printer and lets you set the actual characters you're sending. If you're using AN-SI.SYS,

```
SAY 27 "[8;68;**CL6**;13;**DIR /P**;13p"
```

```
100 ' Program for creating SAY.COM -- by Serge Couture
110 PRINT "Checking DATA statements; please wait..."
120 FOR B=1 TO 7:FOR C=1 TO 17:READ A$:IF C<17 THEN 140
130 I$=I$+VAL(A$)
140 NEXT:NEXT:IF Z$=1662 THEN RESTORE:GOTO 160
150 PRINT "ERROR IN BIG NUMBER AT END OF A LINE -- REDO!":END
160 FOR B=1 TO 7:FOR C=1 TO 16:READ A$:T=VAL(*&H*+A$):NEXT
170 READ S:IF S=T THEN 190
180 PRINT "DATA ERROR IN LINE";B*10+210;"-- REDO":END
190 T=0:NEXT:RESTORE:OPEN "SAY.COM" AS #1 LEN=1:FIELD #1,1 AS D$
200 FOR B=1 TO 7:FOR C=1 TO 16:READ A$:LSET D$=CHR$(VAL(*&H*+A$))
210 PUT #1:NEXT:READ DUMMY$:NEXT:CLOSE:PRINT "SAY.COM CREATED"
220 DATA BE,83,00,FC,B8,00,00,8E,D8,AC,3C,8D,74,4B,3C,22,2469
230 DATA 75,14,80,FD,03,75,0A,AC,3C,22,74,0F,00,F5,01,0B,1652
240 DATA E9,08,F5,01,EB,23,00,FD,85,23,75,08,0A,0A,04,02,CD,2117
250 DATA 21,EB,06,3C,30,7C,12,3C,39,7F,0E,24,0F,93,87,0A,1381
260 DATA F6,07,93,02,D8,07,01,EB,C8,80,0F,08,74,BB,0A,03,2480
270 DATA B4,02,CD,21,0B,00,00,BB,00,00,F7,00,F4,06,0A,D3,1872
280 DATA B4,02,CD,21,20,1A,00,00,00,00,00,00,00,00,00,00,683
```

Figure 1: SAY.BAS program to create SAY.COM improved ECHO command.

redefines F10 to do a clear screen and a DIR /P.

```
SAY 13 "DIR81" 13 "H" 13 | FORMAT B: /S /V
```

lets you format and name a floppy disk without any user intervention.

Serge Couture
Quebec City, Quebec
Canada

While it's true that you can brute-force the ECHO command to mimic some of SAY .COM's talents, SAY is indeed easier and more powerful. And its ability to print multiline scripts makes it a natural for batch file menus. Another technique for producing multiline menus follows.

MENU MAKING MADE EASY

Using the ECHO command to provide prompts or a menu in a batch file is handy

if the text is short. But try to display several lines or a long menu, and ECHO can be frustratingly slow. This is even more irritating in batch files that routinely loop back and redisplay such menus.

The solution is to write a short .COM file that uses function 9 of interrupt 21. The only real drawback is that this technique won't let you display a $, since DOS uses this character 24 to mark the end of the output string. To create a MENU .COM file, get into DEBUG and type in the script shown in Figure 2, substituting your own text for the dummy "Menu Selection 1" and "Menu Selection 2" (omit the comments following the semicolons).

To have MENU.COM display more than just two lines, precede each line with "DB " (and follow each with the line

```
DB  0D  0A
```

PRODUCTIVITY

■ USER-TO-USER

However, make sure the very last line of text (and only that line) contains an extra hex 24, which is the $ that tells DOS your text is done:

```
DB 0D 0A 24
```

When you've finished entering text and typed the 24, hit the Enter key twice. Then you tell DEBUG how long the file is by typing RCX and entering the length of the file in hex. You can figure out the length by subtracting hex 100 from the hex number directly above the RCX. In Figure

2, this number is 12E, so 12E − 100 = 2E.

Once you're done, get into DOS and type MENU to display the text you've entered.

David R. Burford
Mobile, Alabama

We wrote the BASIC MENUMAKR.BAS program in Figure 3 to automate the process. It isn't fancy, but it will center lines if you want, and it handles all the file creation details for you. Since it always names the output file MENU.COM, if you


```
A> DEBUG
-A 100
XXXX:0100 MOV    DX,0109         ; Points to the string
XXXX:0103 MOV    AH,09           ; Selects Function 9
XXXX:0105 INT    21              ; DOS Function Call Service
XXXX:0107 INT    20              ; Exit to DOS
XXXX:0109 db 'Menu Selection 1' ; Beginning of string
XXXX:0119 db 0D 0A               ; CR LF Sequence
XXXX:011B db 'Menu Selection 2' ; 2d Line of Text
XXXX:012B db 0D 0A 24           ; CR LF Delimiter of Text
XXXX:012E
-RCX
CX 0000
:12E
-W
Writing 002E bytes
-Q
```

Figure 2: Script to create MENU.COM. Type in everything underlined and be sure to hit the Enter key twice before the RCX. Don't type in the semicolons or the comments that follow them. This example prints just two lines; see the text for instructions on adding others. After you're done, type MENU to display the lines.

```
100 ' MENUMAKR.BAS -- by PC Magazine
110 CLS:DEF FNST$(S)=MID$(STR$(S),2)
120 DIM A$(24):A$=""TOTAL=0
130 PRINT "Enter your line of text #";FNST$(S);":"
140 LINE INPUT A$(A)
150 IF LEN(A$(A))>79 THEN A$(A)=LEFT$(A$(A),80):GOTO 220
160 PRINT "Want it centered (Y/N)?"
170 I$=INKEY$:IF I$="" THEN 170
180 IF INSTR("YyNn",I$)=0 THEN BEEP:GOTO 170
190 IF INSTR("Yy",I$)<>0 THEN 220
200 A$(A)=STRING$(40-INT(LEN(A$(A))/2),32)+A$(A)
210 PRINT STRING$(2,30);A$(A);CHR$(31)
220 A$(A)=A$(A)+CHR$(13)+CHR$(10)
230 IF A>24 THEN 290 ELSE A=A+1
240 PRINT CHR$(30);"Add any more text (Y/N)?"
250 I$=INKEY$:IF I$="" THEN 250
260 IF INSTR("YyNn",I$)=0 THEN BEEP:GOTO 250
270 IF INSTR("Yy",I$)<>0 THEN 290
280 PRINT CHR$(30):GOTO 130
290 OPEN "MENU.COM" FOR OUTPUT AS 1
300 FOR B=1 TO 9:READ C:PRINT #1,CHR$(C);:NEXT
310 FOR B=1 TO A-1:PRINT #1,A$(B);:NEXT
320 PRINT #1,CHR$(36):CLOSE:END
330 DATA 186,9,1,180,9,205,33,205,32
```

Figure 3: MENUMAKR.BAS program, which automatically creates a MENU.COM text display file. If you use this more than once, be sure to rename existing MENU.COM files so that the new one doesn't obliterate the old.

■ USER-TO-USER

use MENUMAKR more than once, be sure to rename any existing MENU.COM programs you may have created previously.

PERSONALIZED DATA

A recent User-to-User column (Volume 5 Number 8) demonstrated how to modify a comment permanently from within a BASIC program by using the STAMP.BAS program.

It's also possible to modify a quoted string in an assigned statement or DATA statement, since the BASIC interpreter will set up the string variable to point into the program itself when the string is assigned to, or read to, a string variable.

The UPDATER.BAS example in Figure 4 asks for the user's name, displaying the name that is already loaded in the DATA statement as the default. If the user then simply hits the Return key, the program accepts the default; otherwise the program stores the replacement name in

```
100 ' UPDATER.BAS -- by W. B. Teitzel
110 READ DUMMY$
120 PRINT "Enter your name: ";DUMMY$;"]"
130 LINE INPUT I$
140 IF I$="" THEN END ELSE I$=I$+SPACE$(19)
150 P%=VARPTR(DUMMY$)
160 LA=PEEK(P%)
170 A%=CVI(CHR$(PEEK(P%+1))+CHR$(PEEK(P%+2)))
180 FOR I%=1 TO LA
190 POKE A%+I%-1,ASC(MID$(I$,I%))
200 NEXT
210 SAVE "UPDATER"
220 DATA "User name goes here"
```

Figure 4: UPDATER.BAS program that can revise the DATA statement and save the resulting changed program.

the DATA statement and then saves itself.

I used CVI to form the string, since this technique avoids possible overflow errors that can result from multiplication.

Bill Teitzel
Enid, Oklahoma

While this kind of trick can come in handy

when adding new information on the fly, be careful with it, since it can also write bad data over good data. You can get around this by adding a line to the program that saves a backup "UPDATER .BAK" file to disk before it makes any of the changes in memory and then writes the permanently changed file.

CAPITAL IDEA

DOS's IF batch-processing subcommand is case sensitive. This means that for each string comparison, you need two tests—one for uppercase and one for lowercase—such as

```
IF %1==TEST ECHO This is a match.
IF %1==test ECHO This is a match.
```

Even this redundant test does not guarantee a match if the string you enter is a mixture of upper- and lowercase letters in Test or TeSt or TEst. This can easily happen if the string you enter is a city or a person's name or an oddly capitalized computer company—or if you lean too long on the Shift key.

DOS 2.1 and DOS 3.1 store user-entered replaceable parameters in two entirely different places: DOS 2.1 stores them in the critical error-handling segment, and DOS 3.1 stores them just below the environment. Because of this, I had to write two different programs, CAPS2.COM and

```
        A
        MOV   AX,[14]
        ADD   AX,B2
        MOV   DS,AX
        MOV   SI,A
        CMP   BYTE PTR [SI],0
        JZ    128
        CMP   BYTE PTR [SI],61
        JB    11D
        CMP   BYTE PTR [SI],7A
        JA    11D
        AND   BYTE PTR [SI],5F
        INC   SI
        JMP   10B
        INT   20

        RCX
        22
        N CAPS2.COM
        W
        Q
```

Figure 5: CAPS2.SCR for DOS 2.x only! Type this in using a pure-ASCII word processor. Then create CAPS2.COM by redirecting it into DEBUG with DEBUG < CAPS2.SCR. (See Figure 6 for DOS 3.x version.)

CAPS3.COM, to remove the case sensitivity.

Type in the CAPS3.SCR script that applies to the version of DOS you are using (see Figures 5 and 6) and at the DOS prompt enter either

```
DEBUG < CAPS2.SCR
```

or

```
DEBUG < CAPS3.SCR
```

Then insert CAPSx.COM at the beginning—or just after ECHO OFF and CLS—of your batch files and delete the duplicate IF string1==string2 commands. For example, a DOS 3.1 batch file called TEST.BAT that tested to see whether a user entered "MicroPro" would look like this:

```
ECHO OFF
IF %1==1 GOTO OOPS
ECHO You entered %1
CAPS3
```

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Peter Norton

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Another improvement on DOS's pathetic string handling. When is Microsoft or IBM going to give users decent DOS string routines?

```
          A
          MOV     AX,[2C]
          SUB     AX,C
          MOV     DS,AX
          MOV     BX,A
          ADD     BX,10
          MOV     SI,BX
          CMP     BYTE PTR [SI],3A
          JNZ     10B
          INC     SI
          CMP     BYTE PTR [SI],5C
          JNZ     10B
          CLD
          LODSB
          CMP     AL,0
          JNZ     11C
          CMP     BYTE PTR [SI],0
          JZ      136
          CMP     BYTE PTR [SI],61
          JB      133
          CMP     BYTE PTR [SI],7A
          JA      133
          AND     BYTE PTR [SI],5F
          INC     SI
          JMP     121
          INT     20

          RCX
          38
          N CAPS3.COM
          W
          Q
```

Figure 6: *CAPS3.SCR for DOS 3.x only! Create this in using a pure-ASCII word processor. Then create CAPS3.COM by redirecting it into DEBUG with DEBUG < CAPS3.SCR. (See Figure 5 for DOS 2.x version.)*

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■ CHARLES PETZOLD

PC TUTOR

Accessing the DOS environment and directory listings in BASIC programs; how Xmodem handles transmission errors; and Epson printers and IBM graphic characters.

BASIC AND THE ENVIRONMENT

I've been using the undocumented feature of batch files that allows treating environment strings as replaceable parameters. I generally do this to let my batch files know which device drivers are currently loaded and to prevent running incompatible resident programs. For instance, when I load a mouse driver, my AUTOEXEC.BAT file also executes

    SET MOUSE=1

Then I can do things in batch files like this:

    IF "%MOUSE%"=="1" some command
    IF NOT "%MOUSE%"=="1" some other command

But I'd also like to get at the environment in BASIC. Where is this information stored, and how can I access it?

Bruce L. Clarke
Edmonton, Alberta
Canada

This is a good use of the environment, and I really wish IBM and Microsoft would document it. The only problem I've seen is that it doesn't work right under DOS 3.0, but 2.x, 3.1, and 3.2 handle it fine.

The segment address of the environment is always stored at offset &H002C of the Program Segment Prefix (PSP) of any program. So, if you could find the segment address of BASICA.COM's PSP (which will be different depending on which resident programs and device drivers were loaded), you could directly access the environment with PEEK. This would be messy and probably involve some assembly language routines.

There's a much better way, however, and that is to upgrade to PC-DOS 3.1 or later. (Avoid DOS 3.0 as I've indicated above, or you'll have to rewrite your batch files.) The new BASICA 3.0 ENVIRON$ function retrieves strings from the environment based either on the parameter name (such as "PATH") or on a number. The small program listed below shows both approaches. The WHILE loop in the first part displays the same information as the DOS SET command executed without parameters.

    10 I = 1
    20 WHILE ("" <> ENVIRON$(I))
    30   PRINT ENVIRON$(I)
    40   I = I + 1
    50 WEND
    60 PRINT "Your COMSPEC is ";ENVIRON$("COMSPEC")

You will probably find the ENVIRON$ function to be ideal for your purpose.

GOING BACK TO DOS 2.X

I have an IBM PC-XT with a 20-megabyte hard disk formatted under DOS 3.0. Re-

■ The new BASICA 3.0 ENVIRON$ function retrieves strings from the environment based either on the parameter name or on a number.

cently, I absentmindedly booted from a DOS 2.0 disk in drive A:. When I tried to switch to drive C:, I got the message "Invalid Drive Specification." I was immensely relieved to find that all was well again when I booted with 3.0. But is there an explanation for this behavior?

Norman Zacour
Toronto, Ontario
Canada

The enhancements to DOS 3.x include an alternative organization of the file allocation table (FAT) for hard disks greater than 10 megabytes. Briefly stated, DOS 3.x allows cluster sizes on a hard disk to be represented by 16-bit values instead of 12-bit values. This results in a more efficient use of hard disk space. However, DOS 2.x can work only with the old 12-bit FAT.

It's actually a good thing that DOS 2.x doesn't even recognize the 20-megabyte hard disk formatted under DOS 3.x. If the operating system were to assume that the FAT contained 12-bit values, it could easily scramble up the FAT beyond recognition. Since the file allocation table is the most critical part of a disk, this would be a very serious problem.

How does DOS 2.x know whether to leave the disk alone? The answer is another table—the partition table. A hard disk can be divided into one to four partitions, each of which may use a different operating system. (Most XT and AT users allocate the entire hard disk for a single DOS partition, of course.) A table with the partition information is stored on the first sector of the disk. Each partition has a "sys-

■ PC TUTOR

tem indicator,'' a 1-byte value that designates the operating system for the partition. DOS 2.x uses 01 to indicate a DOS partition. DOS 3.x uses a value of 01 for a DOS partition with a 12-bit FAT, but 04 for a DOS partition with a 16-bit FAT. So, when DOS 2.x looks at a hard disk partition table and sees an 04 system indicator, it thinks the partition is non-DOS, even though it really is a DOS partition.

You'll experience this DOS 2.x incompatibility only with hard disks greater than 10 megabytes formatted under DOS 3.x. A normal PC-XT 10-megabyte disk can be used by either DOS 2.x or DOS 3.x, regardless of the formatting.

XMODEM AND ERRORS

A recent article entitled "One Year Later: PC Magazine's Interactive Reader Service" (Volume 5 Number 13) described the Xmodem protocol as "error-checking" and "error-free." Could you please clarify this for me? Does error-checking mean that it only reports errors but does not correct them? My communications program shows an error count during Xmodem transfers. Why would I need to do this if Xmodem is error-free? It doesn't seem as if it's correcting the errors, just tallying them up.

James A. Wahl
Trusaville, Alabama

The Xmodem protocol implemented in many PC communications programs and bulletin boards is more correctly called the "Christensen protocol" to distinguish it from the more sophisticated Xmodem protocol more common in the CP/M world. Christensen's implementation of Xmodem is often used for file transfers of binary (non-ASCII) files, where every byte counts. The protocol implements both a method to check for errors and a way to correct them.

The Xmodem (Christensen) protocol involves sending a file from one computer to another in 128-byte blocks. Each block is preceded by a small header with the block number. The block is followed up with a checksum value. The sending computer requires a confirmation (in the form of an ASCII ACK, or "Acknowledge," signal) from the receiving computer before sending the next block.

If the software on the receiving end finds that the checksum value on a particular block does not agree with the data, it sends back an ASCII NAK ("No Acknowledge") signal. The sending computer then retransmits the block.

The error count that your communications software displays on the screen indicates the number of blocks that had to be retransmitted. If the telephone connection is really bad, this won't go on indefinitely. The Xmodem protocol gives up after 10 retries on a block.

A more detailed technical description of the protocol can be found on many computer bulletin boards.

DOING A DIR IN BASIC

I'm gradually learning the tricks of what IBM BASIC can and cannot do. But there are two things I haven't figured out yet:

(1) How do I read a diskette directory information into an array from a BASIC program?

(2) How do I invoke a Print-Screen from within a program automatically?

M.B. Duffy
Port Neches, Texas

You're going to think this is ridiculous, but a very common method used by BASIC programmers for reading the directory is no more elegant than this:

(1) Clear the screen with CLS.

(2) Do a FILES command to display a directory on the screen.

(3) Read the information off the screen character by character with a combination of the LOCATE statement and the SCREEN function. (The SCREEN function reads characters from the screen; there is also a SCREEN statement used for setting video modes.)

As kludgey as this may sound, I've seen it done in commercial programs. If you'd rather not have the users of your program know what you're doing, you can use the COLOR statement to set the same foreground and background colors so nobody can see the FILES display. (The information is still there, of course.)

You might also consider another method using the SHELL command, which is documented under BASIC 3.0 and works most of the time under BASIC 2.0. The SHELL command executes another pro-

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■ PC TUTOR

gram or a DOS command from BASIC. Your line would read

    SHELL ("DIR > DIRLIST")

This puts a normal DIR listing into a file called DIRLIST. You can then read the DIRLIST file normally and extract the information you want.

Other than these approaches, you'd probably have to use an assembly language subroutine. This would definitely be more complex than either of the two methods described above. BASIC is not the only high-level language that has no built-in facility for obtaining directory information: Turbo Pascal and Microsoft C 3.00 don't either.

Doing a Print-Screen from a BASIC program is much easier. In fact, the IBM BASIC 3.0 manual shows two methods for

> ## ■ BASIC has no built-in facility for obtaining directory information.

doing it in Appendix B on assembly language subroutines. The BIOS Print Screen routine is invoked by an Interrupt 5, which in assembly language takes just two bytes: &HCD and &H05. An assembly language routine in BASIC needs only one more byte, an &HCB, which is a far return back to the main BASIC program. You can determine the bytes needed for an assembly language routine by going into DEBUG assemble mode with the A command and typing

    INT 5
    RETF

and then listing the bytes with the D command.

To get these bytes into a BASIC listing, first DIMension an integer array and store the assembly language code in it:

    10 DIM APRTSC%(2)
    20 APRTSC%(1) = &H05CD
    30 APRTSC%(2) = &H90CB

Each integer can store 2 bytes. (Note that the integers are stored in reverse order,

with the most significant byte higher in memory.) The extra &H90 at the end is a NOP instruction, which does nothing.

After the array is set up, use the VARPTR function to find the address of the array in memory and store it in another variable:

    40 PRTSC% = VARPTR(APRTSC%(1))

Now you need only CALL that variable:

    50 CALL PRTSC%

and your screen will be printed.

PRINTING HIGH CHARACTERS

I have an Epson FX-80+ printer, and I can't get it to print out a degree sign (ASCII 248)—or, for that matter, any of the upper ASCII characters. My screen shows the degree sign, but the printer prints out a lowercase italic x. Can you help?

James B. Walder
Golden Valley, Minnesota

When PC Magazine reviews printers [we reviewed 120 of them in Volume 3 Number 23, 70 more in Volume 4 Number 19, and 97 in Volume 5 Number 19], the table of printer features indicates compatibility with the IBM high-order character set. We include this information so that people interested in printing the IBM high-order characters can select a printer that supports them.

Epson dot matrix printers have traditionally not supported the IBM high-order characters but have instead supplied an italic character set that dates from pre-IBM PC days. You'll also see these italics when you print a screen that contains line or box drawing characters. It wasn't until the FX-85 that Epson included a DIP switch setting to let you select the IBM character set instead of italics.

Probably the easiest way to get old Epson to print something close to a degree sign is to use the lowercase letter o as a superscript. This will be fairly easy if your word processor supports superscripting.

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PC MAGAZINE

COMING UP

NETWORKS The local area network (LAN)—that mass of wires, interface cards, computers, and software that lets your PC share data and peripherals with other PCs in your office—plays a complex and increasingly important role in the corporate workplace. As high-tech manufacturers and their design engineers target new networking solutions to LAN-hungry customers, the marketplace has become crowded with a confusing array of alternatives. Everyone wants an interactive office, but how do you get it going?

PC Magazine untangles this particularly knotty segment of the industry with an in-depth look at networking hardware and software and some connectivity alternatives. In an ongoing series beginning in the next issue, PC Labs will review dozens of networking products, starting with LANs from Proteon, Texas Instruments, Novell, Gateway Communications, Standard Microsystems Corp., and AT&T Information Systems. Upcoming issues will cover subjects like 3Com's Ethernet, zero-slot LANs, network gateways, and networking software.

To help you navigate this complex network jungle, we'll kick off the series with overviews, tutorials, and a decision matrix designed to help you make the right purchasing decision. Each review will include a feature comparison table and definitive PC Labs benchmark test results.

SUPERCHARGING XT HARD DISK PERFORMANCE Despite the proliferation of 80286s and the appearance of 80386 machines, the XT hasn't bit the dust yet. There's still plenty of life and interest in these sturdy machines, and there are ways to keep your XT competitive. Winn L. Rosch explores new technologies and approaches that can speed up an aging XT, along with the hard disks and controller boards that implement them. The PC Labs speed benchmark tests reveal exactly how much extra performance these products, in the right combinations, can squeeze out of your XT.

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